

North Zone Roadside Salvage

Hydrology Report

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02/06/12

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Introduction

The Idaho Panhandle National Forests is proposing to remove vegetation from cut and fill slopes from approximately 600 miles of selected Forest Service roads located in Boundary and Bonner Counties, Idaho and Pend Oreille County, Washington. All proposed roads are currently in a driveable condition. Approximately 410 of the 600 miles of road would have dead, downed, and incidental live hazard trees removed from within 200 feet of specific road shoulders. (See maps) This project would also include road maintenance activities such as culvert replacements, surface blading, and ditch/culvert cleaning. All project activities will be accomplished without equipment leaving the road surface.

Regulatory Framework

The regulatory framework governing management of watershed resources for the analysis includes:

- National Forest Management Act of 1976 (NFMA)
- Idaho Panhandle National Forests Land and Resource Management Plan (Forest Plan)
- Federal Water Pollution Act (Clean Water Act) and amendments
- State of Idaho's implementation of the Clean Water Act
- Rules pertaining to the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code 2000)
- Idaho Stream Channel Protection Act
- Executive Order 11988- Management of floodplains
- Executive Order 11990- Management of wetlands

The National Forest Management Act of 1976 (NFMA)

The NFMA requires that forests provide for a diversity of plant and animal communities based on the suitability and capability of a specific land area. Direction to accomplish this is included in the Idaho Panhandle National Forests Forest Plan (USDA 1987). The Inland Native Fish Strategy (INFS) (USDA Forest Service 1995) amended some Forest Plan direction regarding stream and fish habitat protection measures.

Idaho Panhandle National Forests Land and Resource Management Plan

The Forest Plan guides all natural resource management activities and establishes management standards for the Idaho Panhandle National Forests. The Forest Plan states that "management activities on forest lands will not significantly impair the long-term productivity of the water resource and ensure that state water quality standards will be met or exceeded." Also, "it is the intent of the plan that models be used as a tool to approximate the effects of National Forest activities on water quality values. The models will be used in conjunction with field data, monitoring results, continuing research and professional judgment, to further refine estimated effects and to make recommendations." (IPNF Forest Plan p. II-33) The Inland Native Fish Strategy (INFS) amended the IPNF Forest Plan in August 1995 with additional standards and guidelines to protect the aquatic environment (USDA 1995).

Clean Water Act and Idaho State Water Quality Standards

The Clean Water Act requires the states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. Stipulations in the Clean Water Act require the Environmental Protection Agency (EPA) and the States to develop plans and objectives that will eventually restore identified stream segments of concern. The 2010 Idaho Integrated Report

document was developed by the Idaho Department of Environmental Quality and approved by the EPA in 2011. This document indicates beneficial uses are not fully met in 44 of 52 waterbodies where project activities are proposed. Of these 44, twenty waterbodies have Total Maximum Daily Loads (TMDLs) developed and approved. Specifics of pollutants and TMDL information can be found in the affected environment section of this report. Management activities should not further contribute pollutants of concern into impaired water bodies.

Idaho Forest Practices Act

The Idaho Forest Practices Act regulates forest management on all ownerships in Idaho, including National Forest System lands (IDAPA 20.02.01). The Forest Service has agreements with the state to implement best management practices (BMPs) for all management activities. All activities will meet or exceed guidelines described in the Soil and Water Conservation Handbook (Forest Service Manual 2509.22). Following these BMPs will meet the water quality protection elements of the Idaho Forest Practices Act.

Idaho Stream Channel Protection Act

The Idaho Stream Channel Protection Act regulates stream channel alterations between mean high water marks on perennial streams in Idaho. Instream activities on National Forest system lands must adhere to rules pertaining to the Act (IDAPA 37.03.07). These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

Washington Forest Practices Act

For the areas of this project that lie within the state of Washington, the Washington Forest Practices Rules, particularly WAC (Washington Administrative Code) 222-30, Timber Harvesting, and WAC 222-24, Road Construction and Maintenance, apply. Application of BMPs, INFS standards, and design criteria would meet or exceed requirements within the WFWPA.

Executive Order 11988 – Protection of Floodplains

EO 11988 provides for the protection and management of floodplains. These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

Executive Order 11990 – Protection of Wetlands

EO 11990 provides rules for the protection and management of wetlands. These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

Analysis Area

This project is located along approximately 600 miles of county and Forest Service system roads that pass through national forest system lands located on the Bonners Ferry, Sandpoint, and Priest Lake Ranger Districts of the Idaho Panhandle National Forest. All of the project roads are located within Boundary and Bonner County Idaho and Pend Oreille County, Washington. A complete listing of specific road segments and lengths can be found in the project file. The analysis area for direct and indirect effects, and cumulative effects is defined by 6th code Hydrologic Unit (HUs) watersheds which contain roads proposed for maintenance and salvage activities (see Figure 1).

Figure 1. Map of proposed road segments and 6th code HUs.

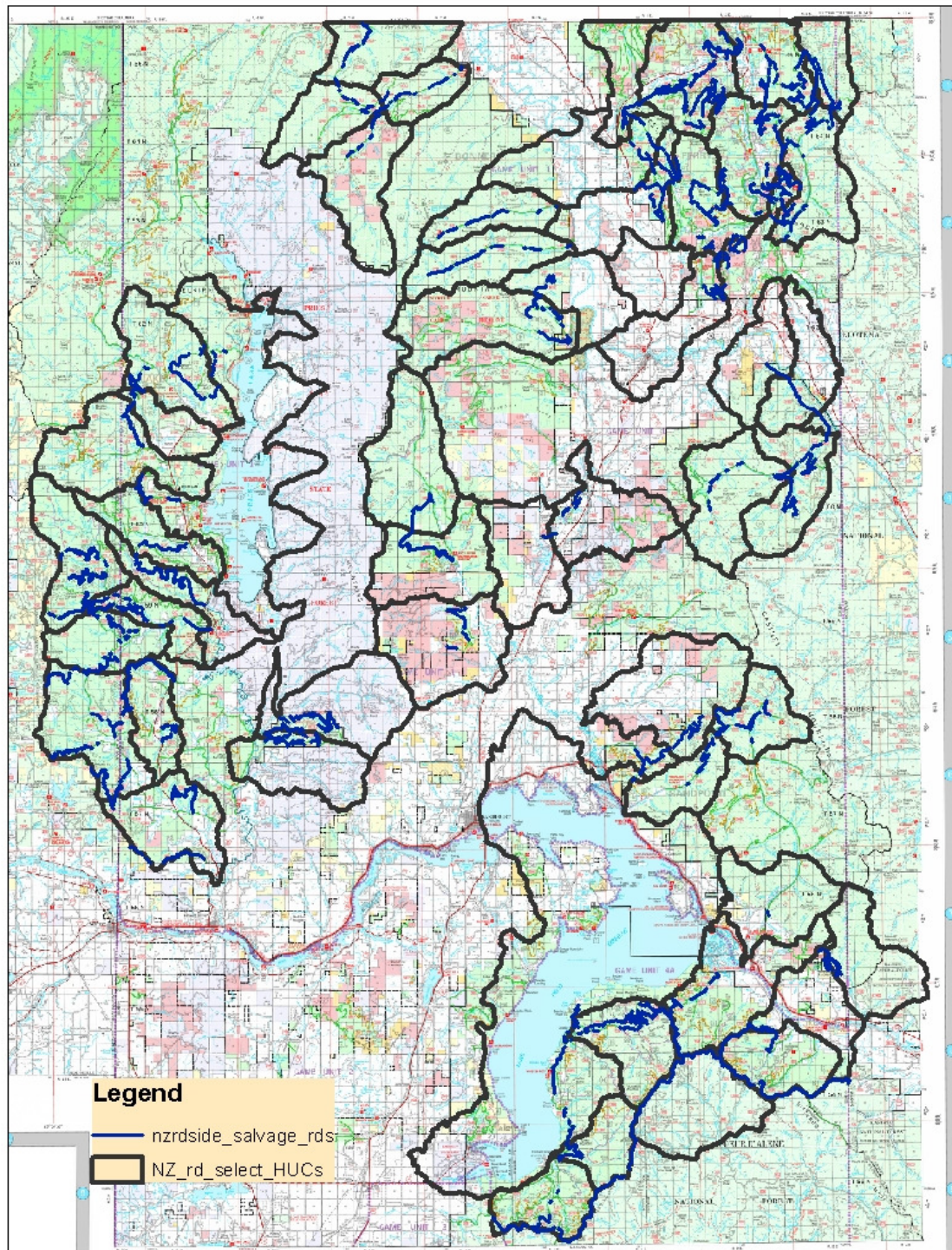


Figure 2. Map of project road segments on the Priest Lake RD.

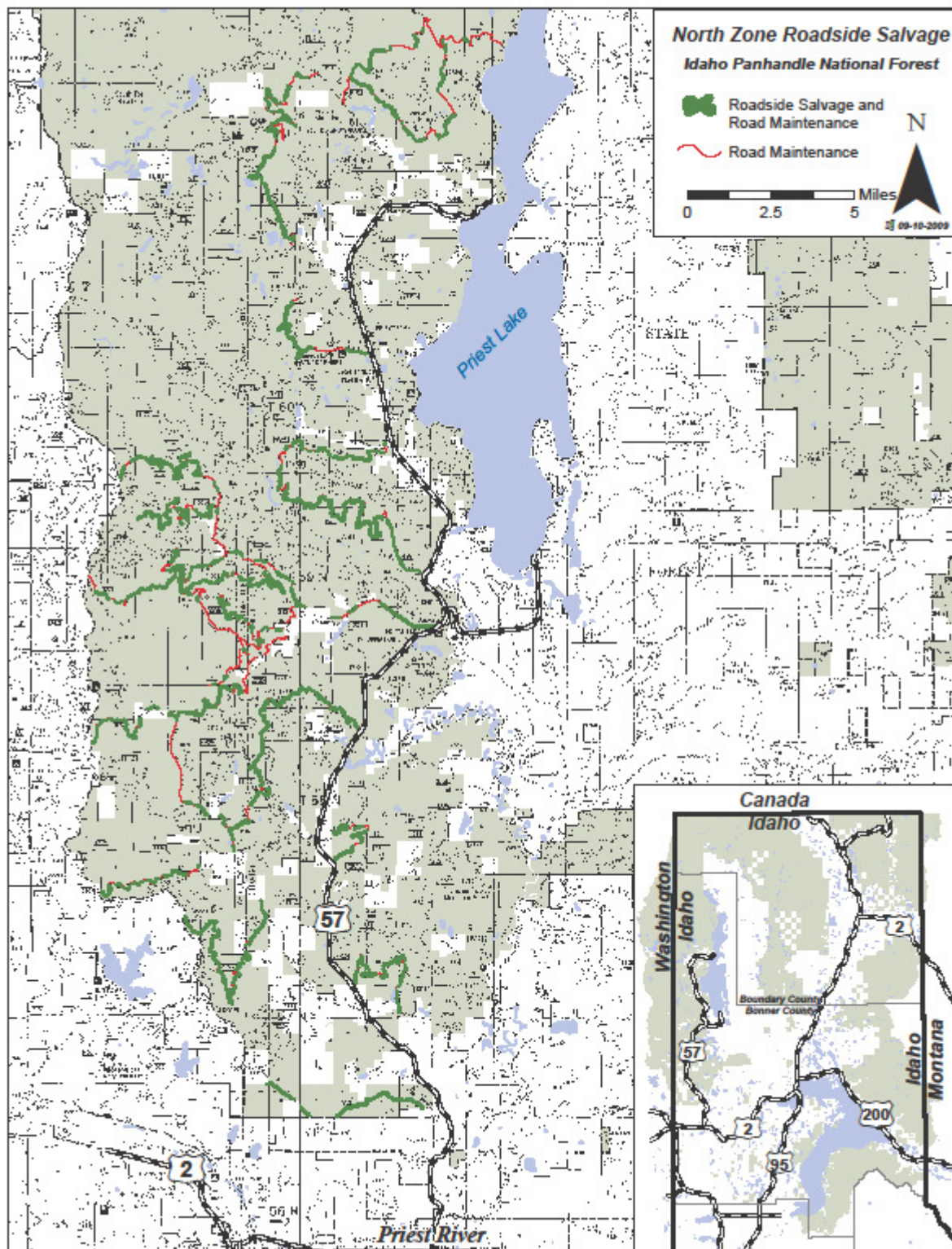


Figure 3. Map of project road segments on the Bonners Ferry RD.

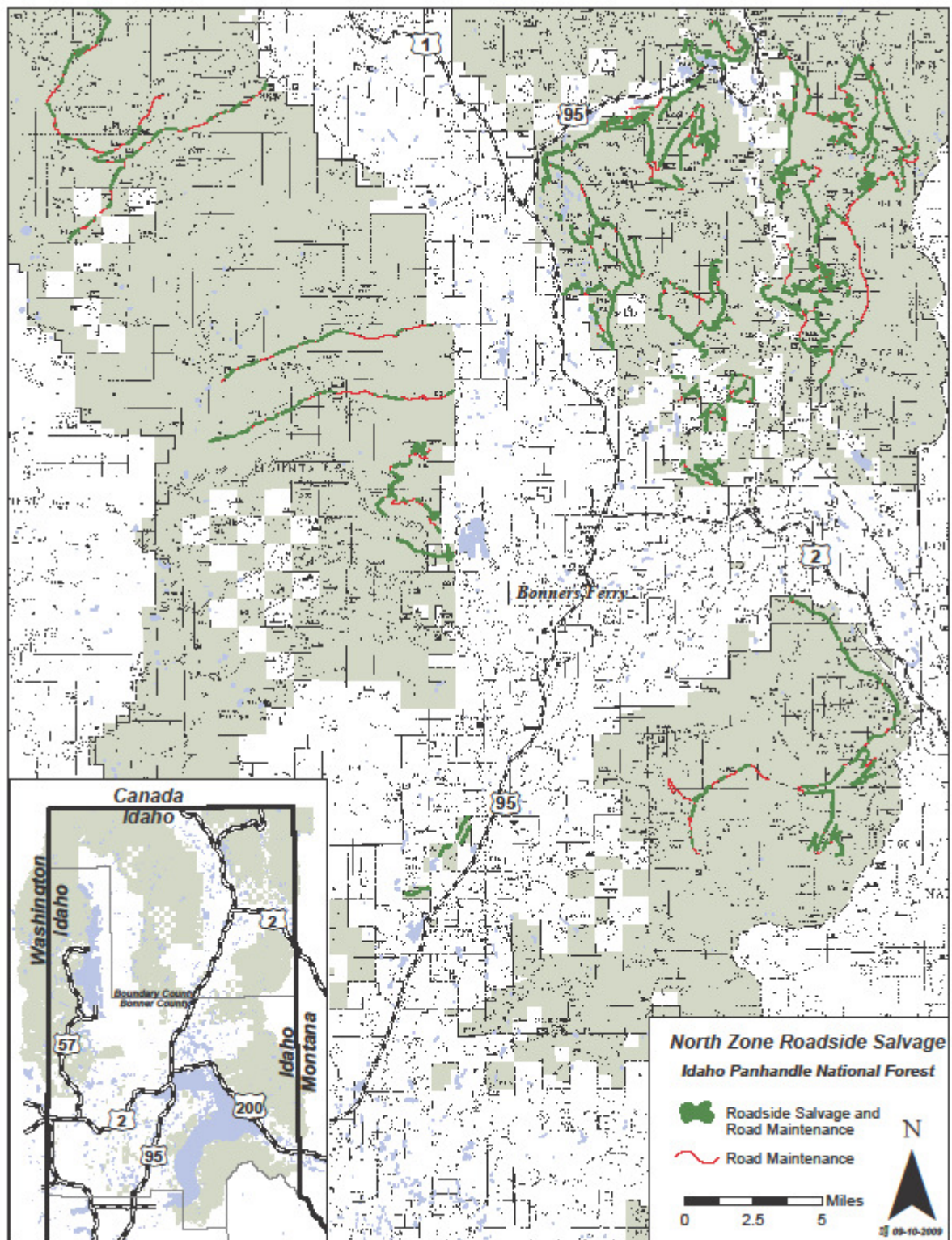
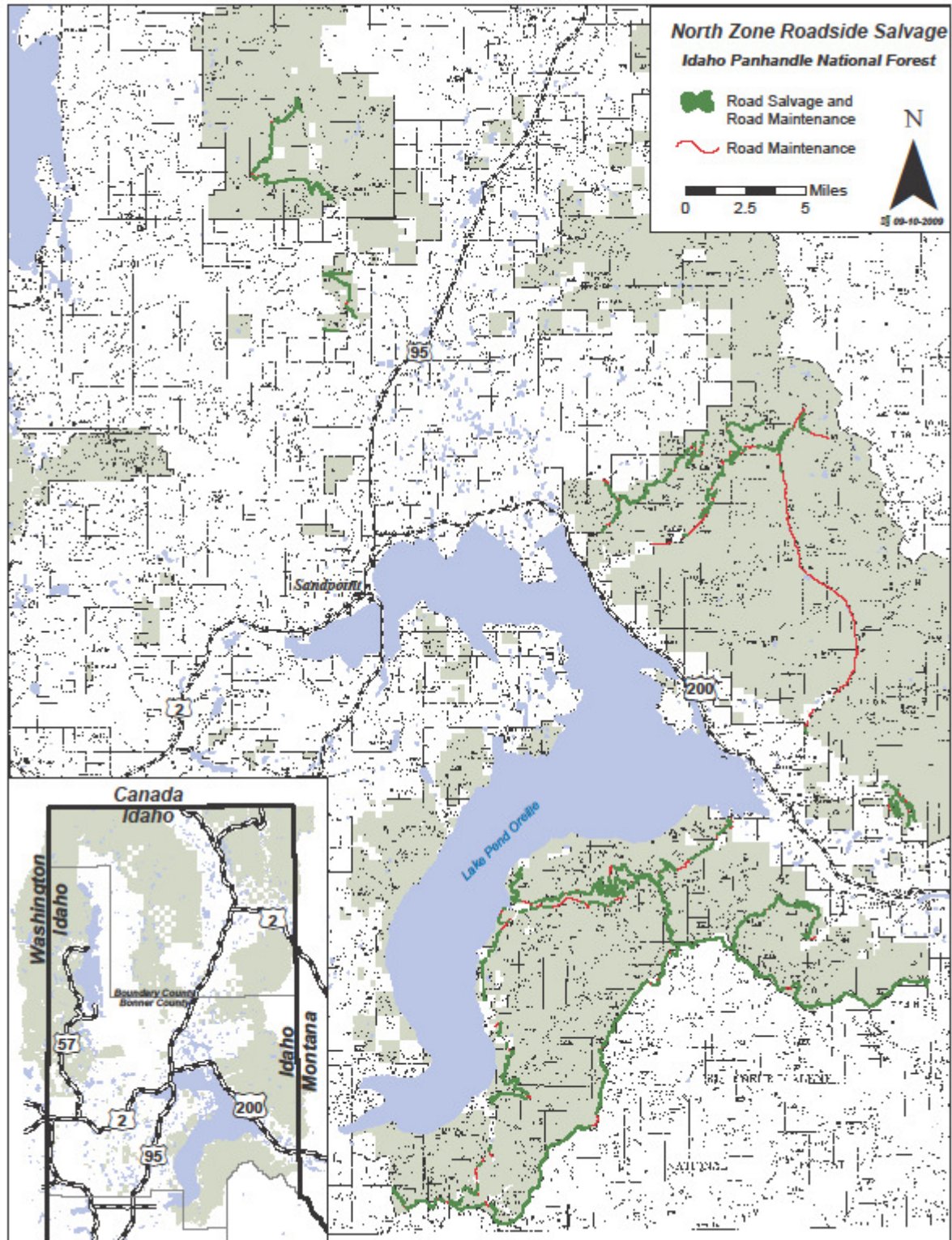


Figure 4. Map of project road segments on the Sandpoint RD.



Methodology

The objective of the aquatics analysis is to disclose the potential effects of the project alternatives on watershed resources. Changes to sediment delivery, water yield and aquatic habitat resulting from the action alternatives were used to evaluate potential effects on watershed resources.

Information and tools used within this report

1. Literature and office review

Background and supporting information for this report was gathered from district fish and hydrology files, geographic information system (GIS) data, historical records, aerial photographs, and published and unpublished scientific literature. Research for this project included discussions with the Idaho Department of Environmental Quality.

2. FS WEPP- Forest Service Water Erosion Prediction Project

Several FS WEPP online interface tools were used as a means to compare sediment delivery from physical disturbances such as existing road conditions and road maintenance. These models and supporting documentation can be found at: <http://forest.moscowfsl.wsu.edu/fswepp/>. The WEPP model is a physically based soil erosion model that provides estimates of soil erosion and sediment yield considering site-specific information about soil texture, climate, ground cover, and topographic settings (Elliot et al. 2000).

FS WEPP:Road is a set of interfaces designed to allow users to quickly evaluate erosion and sediment delivery potential from forest roads. The erosion rates and sediment delivery are predicted by the WEPP model, using input values for forest conditions developed by scientists at the Rocky Mountain Research Station. (Elliot et. al. 1999). The model output used in this report was average annual sediment delivery from the road buffer. The accuracy of the predicted values from WEPP:Road are, at best within plus or minus fifty percent. True erosion rates are highly variable due to large variations in local topography, climate, soil properties, and vegetative properties, so predicted values are only a single estimate of a highly variable process (Elliot et al. 1999).

3. Field reviews

Road segments with proposed activities within the project area were surveyed during the 2010 field season by the project hydrologist and trained hydrological technicians. Roads were surveyed to assess erosional hazards and risks to aquatic ecosystems. Road surveys included examination of stream crossings and drainage structures. All survey information can be found in the project file.

Affected Environment

Topography, Geology, and Climate

Project area roads are located on specific road segments (see figure 1) across the two northernmost Idaho counties and that portion of Pend Oreille, County Washington that lies within

the jurisdiction of the Priest Lake Ranger District. Elevations range from about 1700 feet through 5600 feet.

Climate records from the centrally located weather station in Sandpoint, ID indicates January as the coldest month with average high temperature of 31.9°F and average low of 19.8°F. July is the warmest month with average high and low temperatures of 82.0°F and 48.2°F respectively. Average annual precipitation is 30.92 inches. The wettest month, on average is December with 4.45 inches and the driest month is July with 0.91 inches of precipitation.

The climate data described above was collected at 2100 feet elevation, which is on the lower range of project road elevations. There are significant orographic differences in climate throughout the project area. PRISM, a precipitation model within the US Forest Service WEPP model adjusts precipitation and temperatures based on elevations and topography from established weather station data. The model allows users to input latitude and longitude and the model adjusts the climate for the elevation at that location. The PRISM models shows that elevations above 5000 feet could receive over 50 inches of precipitation per year with cooler temperatures. Site specific climate data derived from PRISM is used for WEPP erosion modeling runs in this analysis.

Geology and soils vary greatly across the project area. Peaks of granite and belt rock, with glacially scoured hillsides, glacial tills and lake deposits below are common. Soils range from coarse decomposed granitics to fine grained silts. Ash capped soils are also very common across this area. A more detailed description of geology and soils can be found in the soils report in the project file.

Water Quality Status

Water quality refers to the physical, chemical, and biological composition of a given water body and how these components affect beneficial uses. The Idaho Department of Environmental Quality requires beneficial uses to be protected for each water body in the state. The Clean Water Act (CWA) requires all water bodies that are deemed to be not fully supporting their beneficial uses by the state (IDEQ) be brought onto the 303(d) list as water quality limited. For waters identified on this list, states must develop a Total Maximum Daily Load (TMDL) for the pollutants set at a level to achieve water quality standards (IDEQ 2006). Table 1 lists impairments and EPA-approved TMDLs for the 6th code hydrologic unit watersheds that proposed road activities would occur.

Table 1. 6th code HUs, listing impairments and TMDLs, where project activities would occur.

6th-HUC code	Watershed Name	303d Listed	Approved TMDL
170101050102	Canuck Creek	Temperature	-
170101050203	Copper Creek-Moyie River	Temperature	-
170101050301	Round Meadows Creek	Temperature	-
170101040707	Mission Creek	Temperature	-
170101040603	Saddle Creek-Boundary Creek	-	Temperature
170101040503	Lower Smith Creek	Temperature	-
170101040502	Cow Creek	Temperature	Sediment/silt
170101050302	Kreist Creek-Moyie River	-	-
170101050304	Deer Creek	Temperature	-
170101040708	Brush Creek-Kootenai River	Temperature	-
170101040501	Upper Smith Creek	Temperature	-
170101040706	Rock Creek-Kootenai River	Temperature	-
		Temperature , Benthic Macroinvertebrate Bioassessments	-
170101050303	Meadow Creek		
170101050305	Skin Creek-Moyie River	Temperature	-
170101040705	Trout Creek	Temperature	-
170101040704	Ball Creek	Temperature	-
170101040304	Dawson Lake-Kootenai River	Temperature	-
170101040703	Burton Creek-Kootenai River	Temperature	-
170102150309	Priest Lake	not assessed	-
170101040301	Sand Creek-Kootenai River	Temperature	-
170101040302	Dobson Creek-Kootenai River	Temperature	-
170101040701	Myrtle Creek	Temperature	-
170102150203	Blacktail Creek-Granite Creek	-	-
170102140101	Headwaters Pack River	Temperature, Phosphorus	Sediment/silt
170101040203	Lime Creek-Kootenai River	Temperature	-
170102150303	Reeder Creek	Sediment/silt, Temperature	Sediment/silt
		Combined Biota/Habitat Bioassessments, Temperature, Sediment/Siltation	Sediment/silt
170102150306	Kalispell Creek		
170101040102	Lower Boulder Creek	Temperature	-
170101040101	Upper Boulder Creek	-	-
170101040403	Trail Creek-Deep Creek	Temperature	Sediment/silt, Temperature

170102150401	Headwaters Upper West Branch Priest River	Combined Biota/Habitat Bioassessments, Temperature	-
170102150308	Lamb Creek	Combined Biota/Habitat Bioassessments, Temperature	-
170102140102	Upper Pack River	-	Sediment/silt
170102150701	Binarch Creek-Priest River	Temperature , Sediment/Silt	Sediment/silt
170102140106	Lower Pack River	Phosphorus, Sediment/silt, Temperature	Sediment/silt
170102140103	Middle Pack River	Phosphorus, Sediment/silt, Temperature	Sediment/silt
170102150402	Goose Creek	Fecal Coliform	-
170102140105	Rapid Lightning Creek	-	-
170102150502	Middle Fork East River-East River	Temperature	Sediment/silt, Temperature
170102150601	Moore's Creek	not assessed	-
170102150602	Flat Creek-Lower West Branch Priest River	not assessed	-
170102131201	Upper Lightning Creek	-	-
170102140206	Lake Pend Oreille	Mercury, Phosphorus, flow regime	Phosphorus
170102140204	Trestle Creek	Temperature	-
170102150703	Big Creek-Priest River	-	-
170102150603	Pine Creek-Lower West Branch Priest River	not assessed	
170102131204	Lower Lightning Creek	Sediment/silt, Temperature	Sediment/silt. , Temperature
170102131307	Blue Creek	not assessed	
170102131310	Clark Fork River-Clark Fork	Cadmium, Copper, Dissolved Gas Supersaturation, Temp, Zinc	Cadmium, Copper, Dissolved Gas, Zinc
170102131309	Clark Fork River-Cabinet Gorge Dam	Cadmium, Copper, Dissolved Gas Supersaturation, Temp, Zinc	Cadmium, Copper, Dissolved Gas, Zinc
170102140203	Granite Creek	aquatic plants, nutrient/eutrophication biological indicators, Temperature	-
170102131308	Twin Creek	Sediment/silt, Temperature	Sediment/silt. , Temperature
170101040401	Deep Creek - Macarthur Lake	Temperature	Sediment/silt, Temperature

170103010101	Upper North Fork Coeur d' Alene River	Temperature	Sediment/silt
170102140202	North Gold Creek	Temperature	Sediment/silt
170102140201	Gold Creek	Temperature	Sediment/silt
		Combined Biota/Habitat Bioassessments, Temperature	-
170102150403	Mission Falls-Upper West Branch Priest River		

Watershed and Erosional Processes

Sediment Yield

Random sediment inputs to stream channels occur as a complex series of pulses that are delivered and stored within low order, high gradient stream channels (Benda and Dunne 1997). Sediment accumulates for centuries within these channels before being transported or “flushed” downstream by episodic events with large increases in water yield (Kirchner et. al. 2001). Transport of sediment plays a fundamental role in the natural function of forested watersheds. In excess, suspended sediment degrades aquatic and fish habitat, disrupts hyporheic connection, enhances the transport of sorbed pollutants, and increases treatment costs associated with municipal water withdrawal (Rehg et. al. 2005). Forests generally have very low erosion rates unless they are disturbed (Elliot et. al. 2000). Common disturbances include timber harvest operations, roads, livestock grazing, mining, prescribed burning, and wildfires. Impacts to soil erosion from these activities lasts a few years before rapid revegetation covers the surface with protective plant litter (Elliot 2004). However, not all impacts to soil erosion are short lived. Numerous research studies have documented that forest roads are usually the leading contributor of sediment to stream channels (Gucinski et al. 2001, Bilby et al. 1989, Duncan et al. 1987). Forest roads can be chronic sources of sediment because; road construction, use, and maintenance compact soils, reduce infiltration, intercept and concentrate surface and subsurface runoff, and limit growth of vegetation. Road ditches can be a direct conduit of sediment from ditch and road erosion into live water bodies. Also, roads can increase the frequency and magnitude of mass wasting (i.e. landslides) by one of several ways:

- Improper alignment can undercut the base of unstable slopes.
- Roads can intercept, divert, and concentrate runoff to sections of the hillside that are unaccustomed to overland flow causing soil saturation and slope failures.
- Culverts and other drainage structures can become plugged with debris and the subsequent flow over the road surface can cause failures.

If roads are located on sensitive landtypes, the probability of failure is increased. All of these characteristics can lead to a negative effect on aquatic resources.

Proximity to streams and road densities can provide a relative measure of road-stream interaction and the relative risk for increased flows and sediment input into the hydrologic system. This is especially true for road density within the RHCAs. Areas with higher road densities within RHCAs are at greater risk for flow modification and sediment loading. Stream crossings are likely points where road erosion can be delivered directly to waterbodies. A review of research in Idaho and elsewhere concluded that non-channelized runoff from roads has a low probability of traveling further than 300 feet (Belt. et al. 1992). The higher road densities in the RHCAs indicate that many of the existing roads closely parallel stream courses. Because of backlogged road

maintenance on some of these routes, it is probable that many of the roads located within RHCAs are currently vectors of sediment to stream channels. Table 2 displays overall road characteristics for the 6th code HUCs that include proposed road segments. Watersheds with higher road densities, especially within RHCAs and those with more frequent stream crossings are more likely to serve as sources and vectors of sediment when maintenance has lapsed.

Table 2. Existing road conditions within 6th Code HUs.

6th-Code HUC	Watershed Name	Existing Roads			Stream Crossings		Proposed Road Maint. w/alts. 2,3,4 (mi)
		Total Existing Roads (miles)	HU Road Density (mi/mi²)	Road Density on Riparian (mi/mi²)	Count of Stream Crossings (#)	Stream Crossing Frequency (#/ mi- stream)	
170101050102	Canuck Creek	83.1	5.2	4.7	72.0	3.0	6.4
170101050203	Copper Creek-Moyie River	107.1	4.3	3.4	85.0	1.8	18.3
170101050301	Round Meadows Creek	103.7	3.1	2.7	66.0	1.4	28.1
170101040707	Mission Creek	92.9	4.7	2.8	28.0	1.1	4.2
170101040603	Saddle Creek-Boundary Creek	52.5	2.1	1.3	30.0	1.2	3.9
170101040503	Lower Smith Creek	33.1	2.2	1.1	5.0	0.4	3.5
170101040502	Cow Creek	35.4	1.6	0.6	22.0	1.0	3.0
170101050302	Kreist Creek-Moyie River	69.2	2.4	2.6	66.0	1.1	20.2
170101050304	Deer Creek	111.8	3.6	3.3	93.0	1.6	12.5
170101040708	Brush Creek-Kootenai River	61.8	1.6	1.9	26.0	0.4	5.1
170101040501	Upper Smith Creek	34.9	1.0	1.5	24.0	0.6	2.2
170101040706	Rock Creek-Kootenai River	78.2	2.6	2.6	34.0	0.7	11.4
170101050303	Meadow Creek	74.1	3.0	3.0	28.0	0.8	12.1
170101050305	Skin Creek-Moyie River	131.7	4.3	3.8	51.0	1.4	13.3
170101040705	Trout Creek	23.1	1.2	1.5	26.0	0.9	3.8
170101040704	Ball Creek	47.5	1.8	1.9	42.0	1.0	4.9
170101040304	Dawson Lake-Kootenai River	114.5	3.6	3.2	44.0	1.2	4.9
170101040703	Burton Creek-Kootenai River	29.4	1.2	1.2	12.0	0.3	3.0
170102150309	Priest Lake	217.1	1.9	2.8	145.0	1.5	5.2
170101040301	Sand Creek-Kootenai River	52.6	2.1	1.8	37.0	1.0	2.9
170101040302	Dobson Creek-Kootenai River	76.6	3.0	2.7	40.0	1.1	1.5
170101040701	Myrtle Creek	93.0	2.2	1.7	60.0	1.0	8.2
170102150203	Blacktail Creek-Granite Creek	119.5	3.4	2.4	72.0	1.3	9.9
170102140101	Headwaters Pack River	45.8	1.1	1.3	44.0	0.7	3.9
170102150303	Reeder Creek	28.6	2.0	0.6	19.0	1.1	1.6
170102150306	Kalispell Creek	87.8	2.2	2.4	55.0	0.9	4.1

170101040102	Lower Boulder Creek	47.8	1.7	1.0	38.0	0.8	9.8
170101040101	Upper Boulder Creek	42.8	1.2	1.6	44.0	0.6	4.3
170101040403	Trail Creek-Deep Creek	136.4	4.4	5.2	82.0	1.8	3.0
170102150401	Headwaters Upper West Branch Priest River	138.5	4.4	3.2	43.0	0.7	16.9
170102150308	Lamb Creek	117.3	5.2	4.7	38.0	1.4	4.7
170102140102	Upper Pack River	84.6	2.4	2.7	60.0	1.1	6.7
170102150701	Binarch Creek-Priest River	131.1	5.7	2.9	17.0	0.6	11.3
170102140106	Lower Pack River	142.5	2.4	2.4	69.0	0.8	4.5
170102140103	Middle Pack River	114.7	2.7	2.8	89.0	1.2	4.3
170102150402	Goose Creek	98.7	4.5	4.7	59.0	1.3	9.1
170102140105	Rapid Lightning Creek	126.6	2.6	2.6	94.0	1.0	4.2
170102150502	Middle Fork East River-East River	166.4	4.3	3.6	75.0	1.5	12.3
170102150601	Moore's Creek	126.4	6.6	4.1	41.0	1.1	11.1
170102150602	Flat Creek-Lower West Branch Priest River	192.9	5.1	3.6	101.0	1.2	18.1
170102131201	Upper Lightning Creek	30.2	1.4	1.2	18.0	0.5	9.3
170102140206	Lake Pend Oreille	395.2	1.4	3.4	194.0	1.1	8.4
170102140204	Trestle Creek	17.7	0.9	1.2	38.0	1.1	4.0
170102150703	Big Creek-Priest River	178.2	6.0	6.4	77.0	1.5	8.8
170102150603	Pine Creek-Lower West Branch Priest River	137.9	4.5	3.9	82.0	1.2	10.1
170102131204	Lower Lightning Creek	38.4	1.2	1.3	42.0	0.5	0.2
170102131307	Blue Creek	28.0	0.9	0.8	16.0	0.2	3.1
170102131310	Clark Fork River-Clark Fork	113.9	2.7	2.9	71.0	0.8	8.6
170102131309	Clark Fork River-Cabinet Gorge Dam	65.7	2.6	2.2	26.0	0.9	6.1
170102140203	Granite Creek	55.2	2.1	2.3	44.0	0.8	18.0
170102131308	Twin Creek	42.2	1.7	1.6	29.0	0.7	10.7
170101040401	Deep Creek - Macarthur Lake	52.2	1.7	1.2	16.0	0.5	0.8
170103010101	Upper North Fork Coeur d' Alene River	137.0	3.7	2.5	76.0	0.9	9.6
170102140202	North Gold Creek	26.1	1.6	0.8	9.0	0.3	6.4
170102140201	Gold Creek	84.9	3.9	4.0	39.0	0.9	8.2
170102150403	Mission Falls-Upper West Branch Priest River	109.2	6.6	4.5	39.0	1.6	12.4

Water Yield and Peak Flows

Changes in duration and intensity of peak flows are often used to measure changes in water yield from vegetation conditions. Watershed processes are very complex and exist with large amounts of natural variability (Elliot and Glaza 2007). Generally, removal of forest canopy through stand-consuming fires, forest insects and disease, or timber harvesting can increase water yield and modify hydrographs (i.e. increased peak flows or altered base flows). Hubbart et al. (2007) detected increases in water yield after partial cut harvesting during the snowmelt season but found no difference in the summer base flow period. However, many researchers have documented high variability in discerning relationships of the percent of a watershed harvested and changes in peak flows (Thomas and Meghan 1998, Grant et al. 2008). As a rule-of-thumb, Stednick (1996) found

that 20% of the vegetation within a watershed must be removed before a measurable change in water yield can be detected.

Environmental Consequences

Direct and Indirect Effects

Alternative 1

Since no management activities would be implemented with this alternative, there would be no direct effects. Water and sediment yield trends discussed in the affected environment would not change from existing conditions and predicted trends barring any future natural disturbances. Past and ongoing activities such as roads and roads use, OHV use, mining, timber harvest, and grazing would continue to affect water resources. Planned road maintenance activities including brushing, blading, and ditch cleaning would continue at current levels and would reduce sediment delivery where implemented. However, current limitations on road maintenance funds and subsequent maintenance delays could perpetuate or increase sediment delivery from surface erosion and increasing risk of culvert failures. No new cumulative effects would be expected under this alternative since no new activities are proposed.

Alternatives 2 (proposed action), 3 and 4

Sediment Yield

Sediment yield from salvage units is expected to be negligible. Minimal soil displacement, compaction or disturbance will occur since no equipment will leave the road surface during harvesting activities. Occasional ¼ acre landings may be needed where turnouts are not present. Proper application of forestry BMPs (Seyedebagheri, 1996) should minimize erosion from treatment units and log landing areas. A recent audit of BMPs pertaining to water quality indicates the USFS averaged 99% compliance with BMP rules since 1996 (IDEQ 2009). Additionally, salvage harvest would not occur on sensitive landtypes or within Riparian Habitat Conservation Areas, which should prevent transport of sediment to any streams.

Forest roads are the most likely source of sediment to project area streams, especially where roads are within 300 feet of waterbodies. Log hauling and equipment use on roads could increase rutting or cause damage to drainage structures that could exacerbate sediment delivery rates. However, sediment delivery from these roads could be minimized through application of road BMPs, (i.e. repair of damaged drainage structures, timing restrictions, etc.) that have been shown to be protective of water quality and beneficial uses (Seyedebagheri, 1996). Appendix A lists road BMPs that would be included in this project.

This project includes design features that would reduce sediment delivery to streams upon project completion. The project would generate funds to complete actions such as surface blading, spot graveling, culvert replacement or installation, ditch and catch basin cleaning, and ditch armoring. Sediment reductions would be realized through improving drainage, eliminating ruts, armoring erodible soils, and increasing the flood capacity of drainage structures. The risk of culvert failure and subsequent sediment delivery would also be reduced by completing these improvements.

These actions would be completed individually or in combination and would be prioritized based on TMDL status and field survey data. For instance, FS road 639 would be a good location to prioritize spot graveling over live water crossings, surface blading, and perhaps ditch armoring since the road lies within the Binarch Creek watershed, which has a TMDL requiring sediment reductions. Whereas roads that have limited sediment delivery potential will likely receive a surface blading to remove ruts and improve drainage.

FS WEPP:Road was used to estimate sediment delivery reductions from the road treatments described. WEPP:Road values reflect road dimensions, design, topography, and proximity to water bodies among other parameters; output is in average annual amount of sediment delivered to streams. Selected road segments were modeled based on 2010 field survey data. Results indicate that sediment delivery reductions ranging from 50% to 78% could be expected from the proposed road improvements. Modeled reductions of 50% were achieved by blading the driving surface to remove ruts. Armoring ditches and adding a gravel lift brought reductions of 78% from existing native surfaced conditions. Erosion research conducted in north Idaho by Spinelli et. al. 2008 found similar reductions and favorable correlation to measured values using FS WEPP:Road. Results similar to those described above could be expected at other project area roads where maintenance and improvements occur. The modeled reductions should be considered a best-case scenario, as actual reductions are dependent on a variety of factors including specific weather events, effectiveness of improvements, proximity to streams, etc. Modeling data can be found in the project file.

Proposed BMPs such as ditch cleaning, upgrading drainage structures or adding additional culverts can reduce the risk of failure and subsequent sediment delivery. However, there would be short-term increases in sediment and turbidity during ditch cleaning or removal and upgrading of culverts. Research has shown that BMPs are effective in limiting sediment delivery from these actions (Foltz 2007). The long term benefit of improved drainage would outweigh any short term increases.

Effects to Sediment Yield by Alternative

Sediment delivery from salvage units is expected to be non-measurable from alternatives 2 or 4. Alternative 3 does not propose salvage harvest. Primary differences regarding sediment delivery between the action alternatives would be most affected by proposed road prescriptions. Proposed road activities from all action alternatives are predicted to reduce net sediment delivery to project area streams. Maximum sediment reductions ranging between 50%-78% could be realized from road segments where BMPs and improvements are implemented. Alternative 2 would offer greater project-wide sediment reductions, above alternatives 3 and 4, since it would generate the most opportunities and funds required to complete road improvements above and beyond BMPs.

Water Yield

Removal of forest canopy reduces the amount of transpiring vegetation and alters snow and rain interception characteristics which can result in increased water yield and hydrograph modifications. Estimated differences in water yield due to any proposed action are expected to be negligible. Only dead and incidental live hazard trees will be harvested from the salvage units proposed with alternatives 2 and 4. Removal of snags will not affect transpiration rates since the trees are no longer alive, and dead trees have limited canopy that could intercept snow or affect shade. Occasional live hazard trees would be removed if they pose a safety risk. Hazard trees would be identified on-site and are not expected to be of a quantity that would impact water yield. Live vegetation is proposed to be removed from road cut and fill slopes along maintenance

segments with alternatives 2 and 3 (see figures 2-4). The live vegetation that would be removed consists of mature and immature conifers and deciduous plants such as pines, alder and willows extending out to a maximum of 20 feet from either road shoulder (unless excluded by other design criteria, see EA). The total percent of each watershed that would have live vegetation removed was calculated for each 6th code HU by multiplying the maximum width (40 ft) by the length of proposed maintenance proposed (table 2). The values ranged from 0 to 0.6% of the total watershed area. Round Prairie Creek and Mission Falls-Upper West Branch Priest River were tied for the maximum value of 0.6% of their total area proposed to have live vegetation removed. As discussed in the affected environment section, Stednick (1996) found that 20% of the vegetation within a watershed must be removed before a measurable change in water yield can be detected. The maximum amount of vegetation proposed to be removed with this project from any 6th code HU totals a fraction of 1%, and is nowhere near the threshold where any changes in water yield could be detected. Therefore, any increases in peak flow under the proposed actions would probably not be detectable in any of the main channels and could not be differentiated from normal climatic fluctuations. Since any changes in water yield or peak flows would not be detectable in project area streams, additional bedload scour or changes in stream morphology during high flows would not be expected. Also, vegetation impacts on water yield are temporary in nature and will attenuate over time as vegetation recovers.

Stream Temperatures

Table 1 displays project area streams that have approved temperature TMDLs or are 303(d) listed as impaired for temperature in the 2008 IDEQ Integrated Report. Project activities must maintain or decrease water temperature in these streams. Direct incoming solar radiation is the dominant energy input for increasing stream temperatures with shade being the single most important variable to reduce this heat input (Cobb 1988, Gravelle and Link 2007). Timber harvest and brushing could potentially increase the amount of solar radiation reaching the streams. Gravelle and Link (2007), found that the use of riparian buffers effectively negated the effects of timber harvest impacts on stream temperatures in the reaches directly below harvested areas. Through the implementation of the INFS (USDA 1995) and the incorporation of RHCAs into the project area, the proposed activities would not further degrade water quality with respect to temperature because RHCAs would retain the canopy cover that prevents solar inputs to the stream. Additionally, standing dead trees removed from the salvage units only provide a fraction of shade provided by living trees with foliated crowns (Amaranthus et.al. 1989).

Cumulative Effects

The potential for cumulative effects was analyzed at each 6th code HU watershed level where project activities are proposed (see figure 1). The 6th code HU analysis area is the next scale larger that would exhibit any cumulative effects if they were to occur from the project. Analysis at a larger scale would likely result in the dilution of any effects. The cumulative effects analysis examines the combination of direct and indirect effects of past, present and reasonably foreseeable activities throughout the project area watersheds.

Past, Present, and Reasonably Foreseeable Actions

The following is a description of past, present and reasonably foreseeable actions that establish the appropriate geographic and temporal boundaries for the cumulative effects analysis. Activities identified below were considered relevant to the watershed cumulative effects analysis. Some

activities are not discussed here because there is no soil or watershed disturbance created. These include tree planting, firewood gathering, hunting, and helispot maintenance.

Past Activities and Events

Wildfires, timber harvesting and road construction activities have occurred throughout each 6th code HU watershed. Past fires and timber harvest have likely caused temporary increases in water yield and sediment delivery, though these effects generally attenuate over time as vegetation recovers. Roads are often sources of sediment to area streams, especially before BMPs were incorporated into designs and construction.

Isolated mining and exploration has occurred throughout the project area, most occurring between the 1920s and 1960s. Most impact to water quality from these areas came from the numerous roads that were constructed to access the prospects. Mines also contribute sediment and elevated levels of metals from tailings piles, especially if they are located near waterbodies. Most mines within the project area have received reclamation efforts (i.e. Chloride Gulch and Conjecture), and are trending towards recovery.

Present, Ongoing, and Reasonably Foreseeable Activities

Fire suppression activities over the last century within the project area have allowed, and would continue to allow, untreated stands to progress toward climax vegetation conditions. The current trend is toward increasing stand densities, which makes them more susceptible to insects, disease and risk of fires (Fire and Fuels section). Since changes in water yield are associated with vegetation conditions, the existing and future trends would have an effect on water yield.

General motor vehicle, off road vehicle, and snowmobile use occurs on roads and trails within the project area. Motorcycles, ATVs and snowmobile use of the area may increase as motorized recreation popularity increases. Increased traffic and a lack of road and trail maintenance can cause an increase in erosion and sediment delivery. However, maintenance activities may include blocking illegal trails where opportunities allow.

Road maintenance activities occur annually to some degree within project watersheds, averaging 100-150 miles per year. These activities include, but are not limited to, blading, brushing, and ditch/culvert cleaning. Maintenance typically improves drainage and decreases erosion from water channeling down the road surface. Culvert and ditch clearing lowers the risk of failures.

Noxious weed treatment and monitoring will occur in areas throughout the project area. This activity would follow guidelines established in the each district's Noxious Weeds Control project EIS. Effects to aquatic resources were analyzed in those documents and adaptive strategies. No additional effects to watershed or fisheries are expected to occur.

Timber Stand Improvement (pruning, thinning, etc.) would occur outside RHCA's except where it could potentially improve riparian habitat. No ground disturbance would occur and timing restrictions would be enacted. No detrimental direct or indirect effects to watershed and fisheries are expected to occur.

Grazing occurs on Forest Service land in four project area watersheds; Cow Creek, Moores Creek, Lamb Creek, and Flat Creek- Lower West Branch Priest River. Continued grazing in riparian areas could contribute to elevated levels of sediment, most originating from trails and

damaged streambanks. Effectively implemented allotment management plans (AMPs) and revisions would be expected to reduce riparian impacts over time.

Land owned by other federal agencies, the state of Idaho and private land makes up a large portion of the project area. Private land is composed of homes, farms and ranches, and private timber company holdings. Some of the roads used for logging activities on these lands have increased and concentrated water flows, increased the potential for landslides and delivered sediment from road fill failures and road surface runoff. Sediment delivery levels from the private roads are based on the level of road maintenance activities. Grazing in riparian areas on the lower reaches of some project streams is expected to continue with similar effects as grazing on USFS lands discussed above.

There are several projects planned for areas within the project area including East Fork Meadow Creek EA, Lower Priest EA, and Leonia EA. These projects include fuels treatment activities, timber harvest, road construction, relocation, maintenance and decommissioning. No project activities would occur within RHCAs except where it would improve riparian habitat. These projects are expected to provide a net benefit to local aquatic resources by reducing sediment delivery and road densities. This would be achieved primarily through road decommissioning.

Cumulative Effects Discussion

Sediment Yield

The combination of direct and indirect effects of all alternatives with past, present and reasonably foreseeable activities within the cumulative effects area would result in an overall net decrease in sediment yield to the project area watersheds upon project completion. Alternative 2 would have the largest potential reduction in sediment, followed by alternatives 3 and 4. These reductions are realized by proposed road maintenance activities, including improvements, upgrades, and use of protective BMPs. Alternative 2 provides the greatest reduction by generating the most opportunities and required funds. All action alternatives provide greater benefit to aquatic resources than alternative 1 since road maintenance funds generated through this project would be independent of and used in conjunction with appropriated road maintenance funds.

Water Yield

With either of the action alternatives, the direct and indirect effects of increased water yield combined with the effects from past, present and reasonably foreseeable activities would not result in any detrimental cumulative effects to project watersheds. The action alternatives would remove mostly dead trees which would have little impact on factors that drive water yield, such as transpiration, shade, and canopy interception. The maximum amount of canopy (live vegetation) that would be removed from any 6th code HU would be 0.6%. This value added to any existing ECA value of project watersheds will not approach a threshold where further examination is warranted. (A table of existing ECA values for the project area 6th code HUCs can be found in the project file.) Additionally, reduction of canopy of that magnitude would not translate to any changes in water yield that could be measured over climatic variability. Any possible increases in water yield would attenuate within 1-3 years as vegetation recovers rapidly. As discussed in the Affected Environment section, the greatest impacts observed from increased water yield occur when culverts become plugged from resulting floods and debris flows. All action alternatives would provide a benefit to the project area by improving roads and drainage structures to accommodate increased flows, thereby reducing risk of failure and subsequent sediment delivery.

Regulatory Consistency

Idaho Panhandle National Forests Plan

All alternatives meet the requirements of the IPNF Forest Plan for water resources and fisheries. All alternatives also meet the requirements for fisheries resources in the Forest Plan, as amended by the Inland Native Fish Strategy.

Clean Water Act, Including Washington and Idaho Implementation

All alternatives would be consistent with the requirements of the Federal Water Pollution Control Act as amended by the Clean Water Act, 33 U.S.C. §1251. of any alternative or any of the foreseeable actions. Through implementation of INFS, BMPs and the net sediment reduction that would take place, risks to beneficial uses designation for support of cold water biota, domestic water supply and salmonid spawning in project area streams and tributaries would be reduced by implementation of any of the action alternatives. All necessary permits will be secured prior to commencing any proposed activities.

Idaho and Washington Forest Practices Acts

Best Management Practices or soil and water conservation practices would be applied under all action alternatives, and all activities comply with the guidelines in the soil and water conservation handbook.

Idaho Stream Channel Protection Act

All alternatives would be consistent with the requirements of this act. INFS criteria incorporates specific protections for stream channels, and is included in this project.

Executive Orders 11988 and 11990

All alternatives are consistent with these EO's regarding floodplains and wetlands. INFS criteria incorporates specific protections for these areas, and is included in this project.

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Appendix A

Selected BMPs applicable to this project.

PRACTICE: 11.01 - Determination of Cumulative Watershed Effects.

OBJECTIVE: To determine the cumulative effects or impacts on beneficial water uses by multiple land management activities. Past, present, or reasonably foreseeable future actions in a watershed are evaluated relative to natural or undisturbed conditions. Cumulative impacts are a change in beneficial water uses caused by the accumulation of individual impacts over time and space. Recovery does not occur before the next individual practice has begun.

EXPLANATION: The Northern and Intermountain Regions will manage watersheds to avoid irreversible effects on the soil resource and to produce water of quality and quantity sufficient to maintain beneficial uses in compliance with State Water Quality Standards. Examples of potential cumulative effects are: 1) reduced natural woody debris input to stream channels that may cause reductions in fish habitat; 2) excess sediment production that may reduce fish habitat and other beneficial uses; 3) water temperature and nutrient increases that may affect beneficial uses; 4) compacted or disturbed soils that may cause site productivity loss and increased soil erosion; and 5) increased water yields and peak flows that may destabilize stream channel equilibrium.

IMPLEMENTATION: As part of the NEPA process, the Forest Service will consider the potential cumulative effects of multiple land management activities in a watershed which may force the soil resource's capacity or the stream's physical or biological system beyond the ability to recover to nearnatural conditions. A watershed cumulative effects feasibility analysis will be required of projects involving significant vegetation removal, prior to including them on implementation schedules, to ensure that the project, considered with other activities, will not increase sediment or water yields beyond or fishery habitat below acceptable limits. The Forest Plan will define these acceptable limits. The Forest Service will also coordinate and cooperate with States and private landowners in assessing cumulative effects in multiple ownership watersheds.

REFERENCES: 40 CFR 1508.7; for portions of Montana, Montana Department of State Lands Cumulative Watershed Effects Cooperative; for Idaho Forests, Idaho Forest Practices Water Quality Management Plan, 1987; R. N. Coats and T. O. Miller. 1981. Cumulative Silvicultural Impacts on Watersheds: A Hydrologic and Regulatory Dilemma. *Envir. Mgt.* 5(2):147-160.

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PRACTICE 11.02 - Soil and Water Resource Monitoring and Evaluation

OBJECTIVE: To determine effects of land management activities on soil productivity and beneficial water uses; to monitor baseline watershed conditions for comparison with State standards, Forest Plan standards, and estimation of long-term trends; to ensure the health and safety of water users; to evaluate SWCP's effectiveness; and to determine the adequacy of data, assumptions, and coefficients in the Forest Plans.

EXPLANATION: The Northern and Intermountain Regions will manage watersheds to avoid irreversible effects on the soil resource and to produce water of quality and quantity sufficient to maintain beneficial uses in compliance with State Water Quality Standards. Monitoring and evaluation are needed as feedback mechanisms to compare the results of management activities and SWCPs on soil and water resources with previous conditions, desired end-products, and State standards. To accomplish this, a comparison will be made, on a representative sample basis, of effects on soils and water over time. Previous monitoring and evaluating has included, for example:

- a. Bulk density, soil disturbance, and/or tree growth to evaluate soil productivity.
- b. Fecal coliform and pH to monitor swimming sites.
- c. Sediment, turbidity, and water temperature to evaluate domestic water supplies.
- d. Sediment, dissolved oxygen, water temperature, pH, cobble embedment, percent fines in substrate, and channel cross sections to monitor effects on fisheries.

IMPLEMENTATION: Forest Plans will provide watershed monitoring plans that are focused on beneficial water uses such as domestic supplies, recreation, and fisheries, and on soil loss and productivity. Regionally approved monitoring techniques will be used. Specific monitoring plans will be coordinated among adjacent National Forests and with State water quality agencies. Specific monitoring and evaluation plans will include such items as:

- a. Monitoring objectives.
- b. Review of existing data and information.
- c. Location of monitoring sites.
- d. Soil and water quality characteristics that are to be monitored and evaluated.
- e. Type(s) or technique(s) of monitoring.
- f. Intensity of monitoring (frequency and duration).
- g. Responsibilities and roles of monitoring personnel.
- h. Methodology for analysis and evaluation.
- i. Estimated cost.
- j. Report preparation.

When changes and effect from management activity are detected, the Forest Service will evaluate their significance and determine appropriate action. Where project level activities will not meet Forest Plan or State standards, they will be redesigned, rescheduled or dropped.

The EPA computerized STORET system is the accepted repository for water quality data collected to monitor and evaluate Forest programs and management activities. Water quality data will be placed in this computer system for storage, manipulation and review.

REFERENCES: FSM 1922, 2525, 2532, and 2554; SWCP Handbook 10.40 Feedback Mechanism; FSH 1909.12, Land and Resource Management Planning Handbook, chapter 6; 36 CFR 219; Solomon, R. A. and Avers, P. E., 1987. A Water Quality Monitoring Framework to Satisfy Legal Requirements. AWRA Symposium on Monitoring, Modeling, and Mediating Water Quality. pp. 231-242; FSH 2509.18, Soil Monitoring Handbook, State Water Quality Standards; for Idaho Forests, Idaho Forest Practices Water Quality Management Plan, 1987; SWCP 12.02, 12.03, and 13.09; S. L. Ponce. 1980. Water Quality Monitoring Programs. USDA, Forest Service, WSDG Tech. Paper - 00002. 66 pp.; for R-4, R-4 Technical Guide for Preparing Water Quality Monitoring Plans, USDA, Forest Service, 1981.

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PRACTICE: 11.03 - Watershed Improvement Planning and Implementation

OBJECTIVE: To improve degraded watershed conditions, to minimize soil erosion, and to improve water availability or quality.

EXPLANATION: Watershed improvement is a corrective measure. Factors considered in the evaluation of soil and water resource problems and subsequent improvement are: predicted changes in water quality and its associated effects on beneficial uses, downstream values, on-site productivity, threat to life and property, direct and indirect economic returns, and social and scenic benefits. Examples of water she improvement measures are stream bank stabilization, debris removal, soil ripping, seeding, and fertilizing.

IMPLEMENTATION: This conservation practice is typically implemented through the development of a soil and water resource improvement inventory, the approval of cost effective plans, and the funding of the plan and subsequent improvement action. If a soil and water resource problem is observed and documented by Line Officers, an interdisciplinary team will assess each site, develop the necessary actions to correct the problem and integrate them into the Forest Planning process for funding and execution. The NEPA process will be followed in the planning and implementation of improvement measures. The actual implementation work may be done by Forest Service crews or contract. Effectiveness of improvement measures will be monitored and evaluated.

REFERENCES: FSM 2522; FSH 2509.15, Watershed Improvement Handbook; NFMA.

PRACTICE: 11.04 - Floodplain Analysis and Evaluation

OBJECTIVE: To protect floodplain values and avoid, where possible, the long and short-term adverse impacts to soil and water resources associated with the occupancy and modification of floodplains.

EXPLANATION: A flood hazard analysis and evaluation will be made prior to acquisition or exchange of land within floodplains. A floodplain analysis and evaluation will be made when sites within floodplains are being considered for structures, developments, or management activities. Environmental quality, ecological effects, and individual safety and health are considered. Flood frequencies, watershed conditions, climatic and environmental factors associated with past flood events, flood flow quantities and specific flood boundaries are all evaluated.

IMPLEMENTATION: The Regional Forester is responsible for ensuring consideration of floodplain hazards and values in all NEPA planning processes. The Forest Supervisor, through use of technical staffs, is responsible for:

- a. Determining if proposed facilities are within 100 and 500 year floodplain boundaries.
- b. Determining if data currently exist about floodplain boundaries.
- c. Documenting analysis of floodplain hazards and management options.
- d. Requiring flood hazard evaluations prior to issuance of special-use permits.
- e. Ensuring that floodplain hazards, management considerations, and appropriate restrictions are included in authorizing documents.
- f. Designing, constructing, or rehabilitating National Forest real property in accordance with criteria outlined in the National Flood Insurance Program.
- g. Providing for conspicuous marking of highest past and probable future flood heights, on permanent structures including those in developed recreation sites.

REFERENCES: EO 11988, Floodplain Management; FSM 2527; Maxwell, J. and LaFayette, R., 1986 Guidelines for Making Floodplain and Wetland Evaluations for Land Exchanges. USDA, Forest Service, Southwestern Region Hydrology Note No. 19a.

PRACTICE: 11.05 - Wetlands Analysis and Evaluation

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OBJECTIVE: To maintain wetlands functions and avoid adverse soil and water resource impacts associated with the destruction or modification of wetlands.

EXPLANATION: The Forest Service does not permit the implementation of activities and new construction in wetlands whenever there is a practical alternative. Through the NEPA process, a wetland analysis and evaluation will be made prior to acquisition or exchange of wetlands. Evaluation of proposed actions in wetlands will consider factors relevant to the proposal's effective on the survival and quality of the wetlands. Factors to be considered include water supply, water quality, recharge areas, flood and storm hazards, flora and fauna species, soil types, habitat diversity and stability, and hydrologic utility.

IMPLEMENTATION: The Regional Forester is responsible for insuring wetland values are considered and documented as an integral part of all planning process. The Forest Supervisor, through use of technical staffs, will determine whether proposed actions should be located in wetlands and, if so, whether there is a practicable alternative. If there are no viable alternatives, the Forest Supervisor must insure that all mitigating measures are incorporated into the plans and designs and that the actions maintain the

function of the wetlands. Identification and mapping of wetlands are part of the Forest Planning process.

REFERENCES: EO 11990, Protection of Wetlands; FSM 2527; Maxwell, J. and LaFayette, R., 1986. Guidelines for Making Floodplain and Wetland Evaluations for Land Exchanges. USDA, Forest Service, Southwestern Region Hydrology Note No. 19a.

PRACTICE 11.06 - Public Supply Watershed Management

OBJECTIVE: To manage community and non-community public supply watersheds to comply with State water quality standards.

EXPLANATION: The Northern and Intermountain Regions will manage public supply watersheds for multiple use with special emphasis on providing water suitable for human consumption within the realm of State Water Quality Standards, water supply regulations, and Forest Plan standards.

IMPLEMENTATION: Watersheds identified by the States as public supply watersheds will be recognized in Forest Plans. Forest Plans will include management goals and standards which will guide the management of the watershed and result in compliance with State Water Quality Standards. All project plans will be reviewed through the NEPA process which includes review by the appropriate State agency and by the water users and tied to direction in the Forest Plans and EIS.

REFERENCES: FSM 2542; State Drinking Standards; State Public Water Supply Regulations; 36 CFR 251.

PRACTICE 11.07 - Oil and Hazardous Substance Spill Contingency Planning

OBJECTIVE: To minimize contamination of waters from accidental spills by prior planning and development of Spill Prevention Control and Countermeasure Plans.

EXPLANATION: A contingency plan is an immediate reporting and action plan that contains a predetermined organization to be implemented in the event of a hazardous substance spill. Factors considered for each spill are: the specific substance spilled, the quantity, its toxicity, proximity of spill to waters, and the hazard to life, property, and the environment.

The Spill Prevention Control & Countermeasure (SPCC) plan is a document which requires appropriate measures to prevent oil, petroleum products, or known hazardous materials that could be spilled from entering the navigable waters of the United States. An SPCC plan is needed if the total, above-ground storage of oil, petroleum products, or known hazardous materials exceeds the appropriate "reportable quantity" and if these facilities could reasonably be expected to discharge these hazardous substances into surface waters in the event of a spill.

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IMPLEMENTATION: Each Forest is responsible for designating emergency spill coordinators and documenting names and telephone numbers of agencies to call regarding notification and clean-up of spills. Individual Forests may maintain an inventory of materials to use during the clean-up of a spill. Disposal sites will be coordinated with EPA, State, and local officials responsible for safe disposal. If a spill is from a Forest Service facility or operation, the Forest Service is the "person in charge" and is responsible for all reporting and immediate response actions, as appropriate. If the spill is from a third party operation, the Forest Service will only respond and report the spill if the third party fails to take appropriate action. The Forest Service will generally turn its incident command role over to authorized, Federal On-Scene Coordinators or other authorized, State or local authorities after their arriving at the spill site, and provide support services.

SPCC plans are required for Forest Service owned and special-use permitted facilities, and include timber sale operators and other construction contracts. All SPCC plans must be reviewed and certified by a registered professional engineer.

REFERENCES: FSH 6740, 7442, 7443, and 7460; 40 CFR 112; FSH 6709.11, Health and Safety Code Handbook; FSH 6709.12, Safety and Health program Handbook; R-1 and R-4 Emergency and Disaster Plan; Oil and Hazardous Substances Pollution Contingency Plan for EPA Regions 8 and 10, 7/26/85; State Hazardous Waste management Plans; SWCP 11.11, 13.07, and 13.10.

PRACTICE: 11.09 - Management by Closure to Use

OBJECTIVE: To exclude activities that could result in damages to facilities or degradation of soil and water resources.

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IMPLEMENTATION: Closures (seasonal, temporary, or permanent) are made when the responsible Line Officer determines that a particular resource or facility needs protection from use. The decision to close an area is made after an evaluation of alternative methods of protection.

REFERENCES: EO 11644, use of Off-Road Vehicles on the Public Lands, and 11989, Off-Road Vehicles on Public Lands; SWCP 12.10.

PRACTICE: 11.11 - Petroleum Storage and Delivery Facilities and Management

OBJECTIVE: To protect surface and subsurface soil and water resources from petroleum fluid contamination resulting from leaking petroleum delivery systems and storage facilities.

EXPLANATION: Petroleum delivery and storage facilities will be located, designed, constructed, and maintained in a manner that minimizes the potential for contamination of surface and subsurface soil and water resources from leaking flowlines, pipelines and storage tanks. Roads, vegetative manipulation, and other considerations should be evaluated in the construction and maintenance of these facilities.

IMPLEMENTATION: The siting and operation of petroleum delivery systems and storage facilities will follow applicable Federal (EPA) and state guidelines and requirements with regard to:

- a. Design/Location.
- b. Construction
- c. Installation.

- d. Operation procedures.
- e. Testing.
- f. Release detection systems.
- g. Recordkeeping requirements.
- h. Leak/spill reporting requirements.
- i. Abandonment.

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Storage facilities and delivery systems on National Forest lands will require a license and/or special use permit. Licenses and permits require the project to comply with all State and local standards. Relevant SWCPs from this and other sections may be required: 11.04, 11.05, 11.07, 11.08, 11.10, 13.04, 13.07-13.13, 14.12-14.14, 14.20, 15.01-15.18, 15.21.

REFERENCES: Resource Conservation and Recovery Act of 1976, (90 Stat. 2795), as amended; Underground Storage Tank Regulations (40 CFR part 280); State Hazardous Waste management Plans; FSM 7460.

PRACTICE: 13.04 - Revegetation of Surface Disturbed Areas

OBJECTIVE: To protect soil productivity and water quality by minimizing soil erosion.

EXPLANATION: This practice is used to stabilize the surface of the disturbed area through the influence of vegetation. The vegetation will be selected to meet many or most of the management objectives for the area; range, wildlife, timber, fuels, minerals, aesthetics, and so forth. Grass or browse species may be seeded between recently planted trees for erosion prevention, wildlife habitat enhancement, or other management needs.

The factors evaluated are soil fertility, slope, aspect, landtype characteristics, soil water holding capacity, climatic factors, vegetation species characteristics, and project objectives. These are filed determinations and office interpretations made by an interdisciplinary team.

IMPLEMENTATION: The identification of disturbed areas and species mix will be determined during the NEPA process. The responsible Line Officer assigns specific individuals to execute the project.

Projects are subsequently monitored to assess the revegetation effectiveness, and need for follow-up action.

REFERENCES: FSM 2522, 2405, 2472, and 7721; SWCP 11.02, 11.03, and 14.13; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 13.05 - Soil Protection During and Following Slash Windrowing

OBJECTIVE: To prevent removal or severe disruption of the productive surface soil and to minimize losses from erosion.

EXPLANATION: Windrowing is a common method of slash treatment removal and surface scarification.

On slopes the material should be windrowed on the contour to act as a filter barrier which catches sediment and detains runoff water. On many forest soils, great care must be taken to preserve the surface soil layer during the windrowing operation.

IMPLEMENTATION: Recommendations on slash windrowing are identified during the NEPA process.

The project supervisor is responsible for enforcing applicable management requirements. The

Contracting Officer is responsible for enforcing contract clauses.

REFERENCES: SWCP 13.01; see references in "Best Management Practice" Definition (05--2 and 3).

14 - TIMBER

Timber harvesting and reforestation are the culmination of several years of timber resource assessment and detailed project planning. The actual physical activities consist of felling, bucking, skidding, yarding, loading and hauling, site preparation, tree planting, and other activities associated with stand establishment.

Planning generally starts 5 to 10 years before the timber is sold for harvesting. First, the land must be suitable for and allocated to timber resource activities in the Forest Plan. The proposed sale must follow the standards, guidelines, and direction within the Forest Plan. Next, a cumulative effects feasibility analysis is conducted prior to including the project on the implementation schedule to ensure that the project will not

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impact soil, water, and other resources beyond acceptable limits. A position statement is then prepared which documents the intent and schedule to harvest and offers tentative harvesting alternatives. The harvest proposal is next considered by an interdisciplinary team which conducts an environmental analysis. Based on the analysis results, the appropriate NEPA document which is tied to the Forest Plan is prepared documenting the estimated effects of the proposed timber project. This is used by the appropriate Line Officer in decision making. When the sale plan is approved, the timber project is implemented under terms of this decision. The Timber Sale Contract and appraisal are then prepared by using contract provisions that were selected to satisfy management constraints and mitigation measures in the environmental analysis. The timber is now advertised and sold to the successful bidder. Finally, the terms of the Timber Sale Contract, including harvesting, are administered on the ground by the certified Sale Administrator and Forest Service Representative.

Success of a good harvest is measured by comparing the on-the-ground results to the management objectives and constraints identified and addressed in the environmental analysis and Forest Plan.

PRACTICE: 14.01 - Timber Sale Planning

OBJECTIVE: To incorporate soil and water resource considerations into Timber Sale Planning.

EXPLANATION: Timber Sale Planning is accomplished through the NEPA process. The environmental analysis will evaluate the potential for impacts to and the cumulative effects on the soil and water resources. If a significant potential exists, the environmental analysis will: (1) consider how to minimize potential effects during and following the sale layout and subsequent logging operations; (2) include mitigation of effects for those treated areas where impacts are unavoidable; (3) and identify

environmentally sensitive areas where impacts from proposed treatments cannot be mitigated to conform with standards.

IMPLEMENTATION: During the NEPA process, an interdisciplinary team will evaluate watershed characteristics and estimate response of soil and water resources to proposed timber harvest and related activities. The NEPA process identifies mitigating measures needed to protect soil and water resources. The subsequent contract will include provisions to meet water quality, soils, and other resource protection requirements as directed by the environmental analysis.

REFERENCES: NFMA; NEPA; FSM 1950, 2431.1, 2431.2, 2511, and 2531; the Timber Sale Contract; individual Forest Plans; SWCP 11.01, 11.02, 11.03, 11.04, 11.05, 11.06, 11.07, and 11.14; FSH 2409.18, Sale Preparation Handbook.

PRACTICE: 14.02 - Timber Harvest Unit Design

OBJECTIVE: To ensure that timber harvest unit design will secure favorable conditions of water flow, maintain water quality and soil productivity, and reduce soil erosion and sedimentation.

EXPLANATION: This is an administrative and preventive practice. The proposed timber harvest units are evaluated to estimate the response on the affected watersheds. This involves field examination, utilization of existing data, analysis of potential watershed response (that is, water yield and sediment yield analysis), and professional judgment. Characteristics to be evaluated can include: (1) the recovery from past harvests; (2) the allowable area that can be harvested; (3) the protection of stream channels; (4) the erosion potential of the area; (5) landform characteristics; (6) the number, size, shape, and location of harvest units; (7) estimated location and size of roads and skid trails; (8) logging system design; and (9) the potential natural recovery rate of the watershed. Where adverse water quality and soil productivity impacts or undesirable streamflows may result, the harvest unit design should be modified, individual units deleted, and/or the natural recovery rate accelerated by using watershed improvement measures.

IMPLEMENTATION: The watershed evaluation of proposed timber harvest is accomplished by the interdisciplinary team during the NEPA process of Timber Sale Planning. Prescriptions to assure A-23

acceptable protection of soil and water resources are incorporated into the environmental analysis. On-the-ground accomplishment of the direction in the environmental analysis is carried out by the Presale Forester, the certified Sale Administrator, the Project Engineer, and the administrator of post sale slash disposal and cultural activities, with review by technical resource staffs. The need for monitoring and evaluation will be identified in the environmental analysis when necessary.

REFERENCES: NFMA (Section 3091-6 F, III-V, and Section 219.10); FSH 2409.15, Timber Sale Administration Handbook, and FSH 2409.18, Sale Preparation Handbook; FSM 2471 and 2409.13; SWCP 11.01, 11.02, 11.03, and 11.134.

PRACTICE: 14.03 - Use of Sale Area Maps for Designating Soil and Water Protection Needs

OBJECTIVE: To delineate the location of protection areas and available water sources and to insure their recognition, proper consideration, and protection on the ground.

EXPLANATION: The following features are designated on the Sale Area Map (and described in associated contract provisions), which is an integral part of the Timber Sale Contract.

- a. Location of stream courses to be protected (perennial, intermittent, and ephemeral).
- b. Wetlands and Riparian Areas (meadows, lakes, pot holes, and so forth) to be protected.
- c. Boundaries of harvest units.
- d. Specified roads.
- e. Roads where log hauling is prohibited or restricted.
- f. Structural improvements.
- g. Areas for different skidding and yarding methods.
- h. Sources of rock for road work, rip-rapping, and so forth.
- i. Water sources available for Purchaser's use.
- j. Other features required by Division "C" contract Provisions.
- k. Domestic or public water supply source.

IMPLEMENTATION: The interdisciplinary team identifies and delineates these and other features on maps which are included in the project design along with a discussion of each feature. The Presale Forester includes them on the Sale Area Map at the time of contract preparation. The features are reviewed on the ground by the Purchaser and the certified Sale Administrator prior to harvesting.

REFERENCES: Timber Sale Contract Provisions B1.1, B6.5, B6.6, C6.51 (R-1); FSM 2431.1 - .3 and 2471; FSH 25409.15, Timber Sale Administration Handbook and FSH 2409.18, Sale Preparation Handbook.

PRACTICE: 14.04 - Limiting the Operating Period of Timber Sale Activities

OBJECTIVE: To minimize soil erosion and sedimentation and loss in soil productivity by insuring that the Purchaser conducts their operations, including erosion control work, road maintenance, and so forth, within the time period specified in the Timber Sale Contract.

EXPLANATION: Timber is purchased by individuals or companies who either harvest the timber themselves or contract harvest to other parties. Therefore, it is necessary to insure that purchasers understand and adhere to soil and water resource recommendations determined in the NEPA process. This is accomplished by setting forth the Purchaser's responsibilities in the Timber Sale Contract.

The C6.3 "Plan of Operation" provision is required in all timber Sale Contracts. This provision states that the Purchaser must submit a general plan of operation which will set forth planned periods for and methods of road construction, completion of slash disposal, erosion control work, and other contractual requirements. Forest Service written approval of the Plan of Operation is a prerequisite to commencement of the Purchaser's operation.

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The contract provision B6.31 "Operation Schedule" requires that the Purchaser shall provide an annual schedule of anticipated activities such as road maintenance and erosion control work.

Contract provision C6.31 "Limited Operating Period" may be used in a contract to limit the Purchaser's operations to specified periods of the year. Provision B6.6 can be used to control operations because of wet weather, high water, and so forth, in order to protect resources.

IMPLEMENTATION: Limited operating periods are identified and recommended during the environmental analysis by the interdisciplinary team. The Presale Forester prepares the contract to include provision C6.31. Provisions B6.3, B6.31, and C6.3 are all mandatory provisions of the timber Sale contract.

Provision C6.3 is only mandatory for sales over a two year contract period. The Purchaser must submit his general plan and annual plans to the Forest Service. The Purchaser may commence operations only after written Forest Service approval of the general plan under C6.3.

REFERENCES: Timber Sale Contract Provisions B6.3, B6.31, B6.65, B6.6, C6.3; FSM 2451 and 2453.2; FSH 2409.18, Sale Preparation Handbook.

PRACTICE: 14.05 - Protection of Unstable Areas

OBJECTIVE: To protect unstable areas and to avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation.

EXPLANATION: This management practice is an administrative and preventive control. Where unstable areas cannot be managed without irreversible effects, they are taken out of suitable forest land base in the Forest Plan and are reclassified as unsuitable forest land. Using existing harvesting technologies, these lands are not managed for timber production because irreversible damage to soil productivity or watershed conditions would result. Timber harvesting is deferred until improved harvesting technologies are developed and proven.

IMPLEMENTATION: The interdisciplinary team during the environmental analysis identifies unstable areas by utilizing input provided by various technical resource staffs. Where unstable areas are presently classified as suitable forest lands and harvest cannot be designed without causing irreversible effects, they are changed to the classification of unsuitable forest lands. If the interdisciplinary team determines that current or prospective logging methods would result in unacceptable watershed impact, the harvest is deferred.

REFERENCES: FSM 2405.13.

PRACTICE: 14.06 - Riparian Area Designation

OBJECTIVE: To minimize the adverse effects on Riparian Areas with prescriptions that manage nearby logging and related land disturbance activities.

EXPLANATION: The Riparian Area is not a zone of exclusion, but an area of closely managed activity. It acts as (1) an effective filter and absorptive zone for sediment; (2) maintains shade; (3) protects aquatic and terrestrial riparian habitats; (4) protects channel and streambanks; and (5) promotes floodplain stability. As a preventive measure, roads, skid trails, landings, and other timber harvesting facilities will be kept out of these areas when feasible or at a prescribed distance from streams and wetlands. Factors such as stream class, channel stability, sideslope steepness, slope stability, resources dependent on these areas, and standards, guidelines, and direction from Forest Plans are considered in determining the management of activities and width of Riparian Areas. Fisheries habitat condition and its estimated response to the proposed timber sale are also evaluated.

IMPLEMENTATION: The Riparian Area requirements are identified during the environmental analysis by the interdisciplinary team. The timber sale project is designed to include site specific recommendations for the prevention of sedimentation and other stream damage from logging activities. The environmental analysis will provide for planning of harvests to insure long-term health and revegetation

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of the Riparian Areas, while meeting shading, debris recruitment, and other management objectives. As appropriate, monitoring and evaluation will be identified in the environmental analysis documentation. The Presale Forester is responsible for the inclusion of the Riparian Areas in the Timber Sale Contract and on the Sale Area Map. The certified Sale Administrator is responsible for contract compliance during harvest operations.

REFERENCES: FSM 2405.13, 2453.2, 2526, and 2471, NEPA; NFMA; Timber Sale Contract Provision C6.5 (R-1), C5.421; SWCP 11.02, 11.05, 13.03, and 14.03; FSH 2409.15, Timber Sale Administration Handbook and FSH 2409.18 Sale Preparation Handbook; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 14.10 - Log Landing Location and Design

OBJECTIVE: To locate landings in such a way as to avoid soil erosion and water quality degradation.

EXPLANATION: This practice is both administrative and preventive. Location of all landing clearing limits shall be agreed to by the Forest Service and Purchaser prior to construction. The following criteria are used in evaluating landings:

- a. The cleared or excavated size of landings shall not exceed that needed for safe and efficient skidding, decking, and loading operations. Every landing must meet the safety requirements of the Occupational Safety and Health Administration.
- b. Where a choice exists, landing locations are selected which involve the least amount of excavation and the least erosion potential.
- c. Where possible, landings are located near the points of ridges so that felled timber lying between drainages can be skidded to the landing without crossing channels or impacting Riparian Areas.
- d. Landings are located where the least number of skid roads are required and sidecast will neither enter drainages nor damage other sensitive areas.

- e. If possible, landings are positioned such that the skid road approach will be nearly level.
- f. Locate landings to minimize the number of tractor roads entering a given landing.
- g. Some landings are designed and constructed as part of specified roads.
- h. Landings are shaped to drain in a planned direction and manner to minimize erosion and sediment delivery to stream courses.
- i. Major landings, such as those for helicopter logging, are treated to restore soil infiltration rates when use is completed.

IMPLEMENTATION: Landing locations chosen by the Purchaser must be agreed to by the certified Sale Administrator. The Sale Administrator can negotiate with the Purchaser's representative to select A-27

mutually acceptable landing locations. Acceptable lands must meet the above criteria. Should agreement not be reached, the decision of the Forest Service shall prevail within the limitations of law.

REFERENCES: Timber Sale Contract Provisions B6.422; FSH 2409.15, Timber Sale Administration Handbook; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion Prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 14.11 - Log Landing Erosion Prevention and Control

OBJECTIVE: To reduce the impacts of erosion and subsequent sedimentation from log landings through the use of mitigating measures.

EXPLANATION: This practice employs administrative, preventive, and corrective controls to meet the objective. Timber Sale Contract requirements provide for erosion prevention and control measures on all landings. Provisions are made in the Timber Sale Contract for landings to have proper drainage. After landings have served the Purchaser's purpose, the Purchaser shall ditch or slope the landings to permit the drainage and dispersion of water. Provisions are also made for revegetation. Other provisions may include scarifying, smoothing and sloping construction of drainage ditches, prevention of water draining off roads from reaching a landing, spreading slash, covering with wood chips, or applying straw mulch. Unless agreed, cut and fill banks around landings shall be sloped to remove overhangs and otherwise minimize erosion. The specific work needed on each landing will depend on the actual ground conditions.

IMPLEMENTATION: The Presale Forester and certified Sale Administrator assess the need for stabilization with technical resource staff input as needed. It is the responsibility of the certified Sale Administrator to insure that this practice is properly implemented on the ground.

REFERENCES: Timber Sale Contract Provisions B6.6, B6.63, B6.422, C6.4, C6.6, C6.601; FSM 2405.13; FSH 2409.15, Timber Sale Administration Handbook; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion Prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 14.12 - Erosion Prevention and Control Measures During Timber Sale Operations

OBJECTIVE: To ensure that the Purchaser's operations shall be conducted reasonably to minimize soil erosion.

EXPLANATION: timber is purchased by individuals or companies who either harvest the timber themselves or contract harvest to other parties. Therefore, it is necessary to insure that purchasers understand and adhere to soil and water resource prescriptions arrived at in the Timber Sale Planning Process. This is accomplished by setting forth the Purchaser's responsibilities in the Timber Sale Contract.

IMPLEMENTATION: Equipment shall not be operated when ground conditions are such that excessive impacts will result. The kinds and intensity of control work done by Purchaser shall be adjusted to ground and weather conditions and the need for controlling runoff. The certified Sale Administrator is responsible for insuring that the Purchaser conducts his operations according to the Timber Sale contract. Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff. If the Purchaser fails to do erosion control work prior to any seasonal period of precipitation or runoff, the Forest Service may temporarily assume responsibility for the work and any unencumbered deposits (performance bonds) may be used by the Forest Service to do the work.

REFERENCES: Timber Sale Contract Provisions B4.225, C6.3, C6.312, C6.6, C6.601; FSM 2451, 2453.2, and 2533, SWCP 14.04; FSH 2409.15, Timber Sale Administration Handbook; see references in "Best A-28

Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion Prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 14.13 - Special Erosion Prevention Measures on Areas Disturbed by Harvest Activities

OBJECTIVE: To prevent erosion and sedimentation on disturbed areas.

EXPLANATION: Where soil is disturbed by Purchaser's operations on tractor roads, skid trails, landings, temporary road fills, and other logging sites, the purchaser shall provide adequate treatment to protect exposed soils. This may be accomplished by spreading slash or wood chips, mulching, establishing an adequate cover of grass or other vegetating acceptable to the Forest Service, or performing other agreed stabilization measures. This provision is to be used only for sales which contain special soil stabilization problems and are not expected to be revegetated by the normal methods prescribed under the standard Timber Sale Contract.

IMPLEMENTATION: The interdisciplinary team will identify areas needing special stabilization measures during the Timber Sale Planning Process. Treatment areas will be verified during sale layout and the estimate of work needed will be carried to the timber sale appraisal. Specific locations to be treated will be designated on the ground by the Forest Service. The Forest Service, upon request, shall provide advice as to soil preparation and the application of suitable seed mixtures, mulch, and fertilizer, and the timing of such

work. It is the responsibility of the certified Sale Administrator to make sure that stabilization work is done correctly and in a timely manner.

REFERENCES: Timber Sale Contract Provisions B6.6, C6.6, and C6.601; SWCP 14.04; FSH 2409.15, Timber Sale Administration Handbook and FSH 2409.18, Sale Preparation handbook.

PRACTICE: 14.14 - Revegetation of Areas Disturbed by Harvest Activities

OBJECTIVES: To establish a vegetative cover on disturbed sites to prevent erosion and sedimentation.

EXPLANATION: Where soil has been severely disturbed by Purchaser's operations and establishment of vegetation is needed to minimize erosion, the Purchaser shall take appropriate measures normally used to establish an adequate cover of grass or other vegetation acceptable to Forest Service or take other agreed stabilization measures. This measure is applied in contracts where it is expected that disturbed soils in parts of the sale area will require vegetative cover for stabilization and the problems will not be mitigated by other contract provisions.

IMPLEMENTATION: An estimate of the need is included in the environmental analysis and timber sale appraisal. The Forest Service shall annually designate on the ground the disturbed soils, such as logging areas and temporary roads, that must be treated.

The Forest Service, upon request, shall provide advice as to soil preparation and the application of suitable seed mixtures, mulch, and fertilizer, and the timing of such work. It is the responsibility of the certified Sale Administrator to make sure that revegetation work is done correctly and in a timely manner.

REFERENCES: Timber Sale Contract Provisions B6.6, C6.6, and C6.601; SWCP 14.14; FSH 2409.15, Timber Sale Administration Handbook and FSH 2409.18, Sale Preparation Handbook.

PRACTICE: 14.17 - Stream Channel Protection (Implementation and Enforcement)

OBJECTIVES: (1) To protect the natural flow of streams; (2) to provide unobstructed passage of stormflows; (3) to reduce sediment and other pollutants from entering streams; and (4) to restore the natural course of any stream as soon as practicable if the stream is diverted as a result of timber management activities.

EXPLANATION: This management practice employs administrative, preventive, and corrective measures to meet the objectives. The following points are fundamental to protecting stream channels:

a. Location and motif of stream crossings must be agreed to prior to construction. This is done when locations of skid trails, tractor roads, and temporary roads are agreed on by the Forest Service and the Purchaser.

b. Purchaser shall repair all damage to a streamcourse caused by Purchaser's operations, including damage to banks and channel, to an acceptable condition as agreed to by the certified Sale Administrator and Purchaser's representative.

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c. All project debris shall be removed from streamcourse and in an agreed manner that will cause the least disturbance.

d. Wheeled or track laying equipment shall not operate within 50 feet slope distance of the apparent high water mark of streamcourses designated for protection in the Timber Sale Contract, except as agreed to by the certified Sale Administrator and the Purchaser.

e. When ground skidding systems are employed, logs will be end-lined out of streamside and Riparian Areas. Equipment is permitted to enter streamside areas only at locations and times agreed to by the certified Sale Administrator and the Purchaser.

f. Water bars and other erosion control structures will be located to prevent water and sediment from being channeled into streamcourses, and to dissipate concentrated flows.

g. Material from temporary road and skid trail stream crossings is removed and streambanks restored to an acceptable condition, as agreed to by the certified Sale Administrator and Purchaser's representative.

h. Logs or products shall be fully suspended above the ground when crossing streamcourses designated for protection in the Timber Sale Contract.

IMPLEMENTATION: The certified Sale Administrator works with the Purchaser's representative to insure that the Timber Sale Contract clauses covering the above items are carried out on the ground. Technical resource staffs can be consulted to help the Sale Administrator with decisions. In the event Purchaser causes debris to enter streamcourses in amounts which adversely affect the natural flow of the stream, water quality, or fishery resources, Purchaser shall remove such debris within 48 hours and in an agreed manner that will cause the least disturbance to streamcourses.

REFERENCES: FSM 2405.13 and 2452; FSH 2409.15, Timber Sale Administration Handbook; Timber Sale Contract Provisions B6.5, B6.6, C6.5 (R-1), C6.6, C6.51 (R-1), and C6.53 (R-1); see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion revention and Control on Timber Sale Areas, May 1981.

PRACTICE: 14.18 - Erosion Control Structure Maintenance

OBJECTIVE: To insure that constructed erosion control structures are stabilized and working effectively.

EXPLANATION: Erosion control structures are only effective when they are in good repair and stable condition. Once the erosion control structures are constructed and seeded, there is a possibility that they may not become adequately vegetated or they may become damaged from subsequent harvest activities. It is necessary to provide follow-up inspection and structural maintenance in order to avoid these problems and insure adequate erosion control.

IMPLEMENTATION: During the period of the Timber Sale Contract, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized, but not for more than one year after their construction. After 1 year, erosion control work needed is

accomplished through Watershed Improvement practices (SWCP 11.03).

The Forest Service may agree to perform such structure maintenance under B4.225 (Cooperative Deposits), if requested by the Purchaser, subject to agreement on rates. If the Purchaser fails to do seasonal maintenance work, the Forest Service may assume the responsibility and charge the Purchaser accordingly.

REFERENCES: Timber Sale Contract Provisions B6.6, B6.66, and B4.225; FSH 2409.15, Timber Sale Administration Handbook.

PRACTICE: 14.19 - Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

OBJECTIVE: To assure the adequacy of required erosion control work on timber sales.

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EXPLANATION: The effectiveness of soil erosion prevention and control measures is determined by the results found after sale areas have been exposed one or more years to the elements. Although a careful check is required before a timber sale is closed to assure that planned erosion work has been completed to the standard prescribed, the erosion prevention work done in previous years should be periodically inspected during the life of the timber sale. These inspections will help determine whether the planned work was adequate, if maintenance work is needed, the practicability of the various treatments used, and the necessity for modifying present standards or procedures.

IMPLEMENTATION: "Acceptable" erosion control means only minor deviation from established standards, provided no major or lasting impact is caused to soil and water resources. Certified Sale Administrators will not accept as complete erosion control, measures which fail to meet this criteria.

REFERENCES: FSM 2451, 2452, 2453, and 2456; Timber Sale Contract Provisions B6.6, B6.63, B6.64, B6.65, B6.66, and C6.6; SWCP 11.02; FSH 2409.15, Timber Sale Administration Handbook.

PRACTICE: 14.20 - Slash Treatment in Sensitive Areas

OBJECTIVE: To protect water quality by protecting sensitive tributary areas from degradation which would result from using mechanized equipment for slash disposal.

EXPLANATION: Special slash treatment may be prescribed in sensitive areas to facilitate slash disposal without use of mechanized equipment. Meadows, wetlands, Riparian Areas, and landslide areas are typically sensitive areas where equipment use is normally prohibited. Slash treatment methods are indicated for each harvest unit on the Slash Treatment Map and referenced in associated contract provisions.

IMPLEMENTATION: Sensitive areas needing protection are identified by the interdisciplinary team in the Timber Sale Planning Process. Results are documented during the environmental analysis and identified in the Timber Sale Contract and on the Slash Treatment Map. The certified Sale Administrator inspects the treatment for correct and satisfactory slash disposal accomplishment.

REFERENCES: Timber Sale Contract; SWCP 14.08, 14.16, and 14.17; FSH 2409.15, Timber Sale Administration Handbook and FSH 2409.18, Sale Preparation Handbook.

PRACTICE: 14.21 - Non-recurring "C" Provisions for Soil and Water Protection

OBJECTIVE: To exercise the option of inserting non-recurring (Special) "C" provisions into the Timber Sale Contract to protect soil and water resources, where standard "B" or "C" provisions do not apply or are inadequate to protect watershed values.

EXPLANATION: Non-recurring "C" provisions are sometimes needed to meet management objectives on a particular sale area. They require Regional Forester approval and may only be included in the sale for which approval was given. This practice can be used for a variety of special situations which may occur on any timber sale. There are no standard or set provisions that can be referenced, since each Special "C" provision is unique and specific to one sale.

IMPLEMENTATION: The need for non-recurring "C" provisions is identified during the Timber Sale Planning Process and environmental analysis by the interdisciplinary team. The Presale Forester prepares the non-recurring "C" provision and submits it through Line Officers to the Regional Forester for approval. The Regional Forester insures that the wording complements the Timber Sale Contract and returns it to the District with approval. The non-recurring "C" provision is applied by the certified Sale Administrator in the same manner as the standard contract provisions.

REFERENCES: FSM 2431.2, 2431.3, and 2431.4; FSH 2409.18, Sale Preparation Handbook.

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PRACTICE: 14.22 - Modification of the Timber Sale Contract

OBJECTIVE: To modify the Timber Sale contract if new circumstances or conditions indicate that the timber sale will cause irreversible damage to soil, water, or watershed values.

EXPLANATION: Once timber sales are sold, they are harvested as described in the Timber Sale Contract. However, it may be necessary to modify a timber sale contract because of new concerns about the effects of the sale on soil and water resources.

IMPLEMENTATION: If evidence indicates that unacceptable impacts would occur to soil and water resources if the sale was harvested as planned, the Forest Service Representative will request the Contracting Officer to gain Regional Forester advice and approval to proceed with a resource environmental modification, mutual cancellation, or unilateral cancellation of the Timber Sale Contract. Once the decision to take action is approved by the Regional Forester, the appropriate Line Officer will assign an interdisciplinary team to make recommendations for implementation.

REFERENCES: NFMA, Section 6; Timber Sale Contract Provision B8.3; SWCP Handbook 10.40, Feedback Mechanism.

PRACTICE: 14.23 - Reforestation Requirement

OBJECTIVE: To promote prompt reforestation and to limit disturbance on areas with limited regeneration potential.

EXPLANATION: Forested lands will not be planned for timber harvest production objectives unless there is reasonable assurance that these sites can be adequately restocked within 5 years after final harvest, based on existing technology and knowledge. The 5-year time frame begins at different times for different silvicultural systems. Restocking is adequate when the cut area contains the minimum number, size, distribution, and species composition of regeneration as specified in the silvicultural prescription. Site preparation, species selection, and seedling protection are critical factors that need consideration for successful regeneration. The implementation of this practice affects soil and water resources by stabilizing solids, increasing ground cover, improving infiltration, and reducing surplus water yields. In meeting overall resource objectives, some timber stands may be harvested to achieve multiple resource objectives other than timber production. Delaying immediate regeneration may be desirable for meeting the overall objectives.

IMPLEMENTATION: During the Timber Sale Planning Process, the interdisciplinary team assesses the resource objectives of the proposed areas and the capability to achieve reforestation within the prescribed period. The environmental analysis contains the interdisciplinary team determinations and recommendations. Past and present reforestation activities will be evaluated.

REFERENCES: FSH 2409.25b, Reforestation Handbook; NFMA (36 CFR 219.27 c(3)); FSM 2472; SWCP 11.02.

PRACTICE: 15.01 - General Guidelines for Transportation Planning

OBJECTIVE: To introduce soil and water resource considerations into Transportation Planning.

EXPLANATION: Transportation Planning shall be included as an integral part of the Forest Planning process. In some cases, a transportation facility may itself require an appropriate NEPA document. Transportation systems will be planned to achieve an optimum balance of minimum environmental effects at minimum, overall long-term cost, while meeting the land and resource management objectives.

Transportation Planning shall develop and evaluate alternative methods of providing needed transport services. Alternative methods may include alternative modes, routes, geometric features, materials standards, or some combination thereof. Evaluation shall include determining the social, environmental, and economic characteristics of each alternative. Selection of a recommended alternative shall be by the responsible Line Officer and the decision shall be documented. No implementing activities shall be undertaken prior to the approval by the responsible official.

IMPLEMENTATION: An interdisciplinary team during the NEPA process will evaluate watershed characteristics and estimate the response of soil and water resources to proposed transportation alternatives and activities. The NEPA process will identify mitigating measures needed to protect soil and water resources. The subsequent contract will include provisions to meet water quality, soil, and other resource protection requirements as directed by the environmental analysis.

REFERENCES: FSM 1950, 7700, and 7710; NFMA; NEPA; individual Forest Plans; SWCP 11.01, 11.02, 11.03, 11.04, 11.05, 11.06, 11.09, and 11.14; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion Prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 15.03 - Road and Trail Erosion Control Plan

OBJECTIVE: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and maintenance activities through effective contract administration during construction and timely implementation of erosion control practices.

EXPLANATION: Land disturbing activities usually result in at least short-term erosion. Poorly designed, located, constructed, and maintained roads and trails are usually responsible for the majority of stream sedimentation problems associated with forest management practices. By effectively planning for erosion control, sedimentation can be minimized.

Roads and trails require a variety of erosion control measures. Many erosion control practices will not only protect water quality but also maintain road prism integrity, reduce maintenance costs, and improve trafficability. The location of the road or trail with respect to streams, beneficial uses of that water, soil, and geologic information and other site factors govern the degree of stabilization required. Stabilization usually includes a combination of practices that promotes the reestablishment of vegetation on exposed A-35

slopes, provides physical protection to exposed surfaces, prevents and downslope movement of soil, or controls road drainage.

Since a newly constructed road is most susceptible to erosion from seasonal precipitation, the timing of erosion control practices is of primary concern. Those practices that can be accomplished concurrent with road counteractions shall be favored as a means of immediate protection of the water resource.

IMPLEMENTATION: Erosion control objectives and detailed mitigation measures are developed using an interdisciplinary approach during the environmental analysis. These measures and objectives shall be reflected in the contract specifications and provisions for the road or trail. When standard specifications do not provide the degree of mitigation required, special project specifications will be developed by the interdisciplinary team.

Prior to the start of construction, the Purchaser shall submit a schedule for proposed erosion control work as required in the Standard Specifications. The schedule shall include all erosion control items identified in the specifications. The schedule shall consider erosion control work necessary for all phases of the project. The Purchaser's construction schedule and plan of operation will be reviewed in conjunction with the erosion control plan to insure their compatibility before any schedules are approved. No work will be permitted on the project until all schedules have been approved by the Contracting Officer.

The Contracting Officer or Engineering Representative shall ensure that erosion control measures are implemented according to the approved schedule and are completed in an acceptable fashion. Field reviews and on-site inspection by the Line Officer and/or Forest Engineer will identify any additional erosion control measures required to protect the streams that were not recognized during planning or design. Necessary correction measures shall be implemented immediately through normal administrative channels.

The following items may be considered as erosion control measures when constructed in a timely manner. To maximize effectiveness, erosion control measures must be in place and functional prior to seasonal precipitation or runoff.

- a. Measures to reestablish vegetation on exposed soils. This is usually accomplished by seeding suitable grass and legume species in conjunction with mulching and fertilization. In some situations, treatments may include tree seedling planting or sprigging of other woody species.
 - b. measures which physically protect the soil surface from detachment or modify the topography to minimize erosion. These treatments may include the use of dust oil or gravel on the road travelway and ditches and the use of mulches, riprap, erosion mats, and terracing on cuts, fills, and ditches. Temporary waterbars in areas of uncompleted roads and trails can be effectively utilized to reduce sedimentation.
 - c. Measures which physically inhibit the downslope movement of sediments to streams. These may include the use of slash filter windrows on or below the fill slopes, baled straw in ditches or below fillslopes, catch basins at culvert inlets, and sediment basin slash filter windrows may be utilized in live water drainages where fish passage is not required and where peakflows are low.
 - d. Measures that reduce the amount of soil disturbance in or near streams. These measures may include de-watering culvert installation or other construction sites, and immediate placement of permanent culverts during road pioneering. Temporary pipes should not be allowed unless positive control of sedimentation can be accomplished during installation, use, and removal.
 - e. Measures that control the concentration and flow of surface and subsurface water. These may include insloping, outsloping, ditches, cross drains, under drains, trenches, and so forth.
- REFERENCES: FSM 7721, 7722, and 7723; Timber Sale Contract Provisions B6.31, B6.5, B6.6, and C6.3; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion prevention and Control on Timber Sale Areas, May 1981; Cook, M.J. and J.G. King. 1983. Construction Cost and Erosion Control Effectiveness of Filter Windrows on Fill Slopes. USDA Forest A-36

Service Research Note, INT-335; SWCP Handbook 10.40 Feedback mechanism; FSH 7709.56b, Drainage Structures Handbook.

PRACTICE: 15.04 - Timing of Construction Activities

OBJECTIVE: To minimize erosion by conducting operations during minimal runoff periods.

EXPLANATION: Erosion and sedimentation are directly related to runoff. Scheduling operations during periods when the probabilities for rain and runoff are low is an essential element of effective erosion control. Purchasers shall schedule and conduct operations to prevent erosion and sedimentation.

Equipment shall not be operated when ground conditions are such that excessive impacts will result. Such conditions are identified by the Contracting Officer or Engineering Representative with assistance from technical resource staffs as needed. Temporary erosion control measures may be required to prevent, control, and mitigate erosion and sedimentation.

In addition, it is important to keep permanent erosion control work as current as practicable with ongoing operations. Construction of drainage facilities and performance of other contract work which will contribute to the control of erosion and sedimentation shall be carried out concurrent with earthwork operations or as soon thereafter as practicable. Limitation of the amount of area being graded at a site at any one time, and minimization of the time that an area is laid bare should be a consideration in contract preparation. Erosion control work must be kept current when road construction occurs outside of the normal operating season.

IMPLEMENTATION: Detailed erosion control measures are developed by an interdisciplinary team during the environmental analysis and are incorporated into the contract specifications. Compliance with plans, specifications, and the operating plan is assured by the Contracting Officer and/or Engineering Representative.

REFERENCES: FAR 52.236-15; Timber Sale Contract Provisions C6.3, C6.36, and B6.31; SWCP 15.03; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICES: 15.05 - Slope Stabilization and Prevention of Mass Failures

OBJECTIVES: To reduce sedimentation by minimizing the chances for road-related mass failures, including landslides and embankment slumps.

EXPLANATION: Road construction in mountainous terrain requires cutting and loading natural slopes which may lead to landslides and/or embankment failures depending on the soil strength, geology, vegetation, aspect, and groundwater regime. Landslides and embankment failures are undesirable because they interrupt traffic, are costly to repair, visually unacceptable, and generate large quantities of erosion and sedimentation.

Roadways may drastically change the subsurface drainage characteristics of a slope. Since the angle and height of cut and fill slopes increase the risk of instability, it is often necessary to provide subsurface drainage to avoid moisture saturation and subsequent slope failure. Where it is necessary, horizontal drains, drainage trenches, or drainage blankets may be used to lower the subsurface water levels and to prevent groundwater from entering embankments.

In areas with high landslide potential, the composition and characteristics of embankments may be

controlled since they are essentially engineered structures. Care must be taken to prevent the incorporation of construction slash or other organic material and the embankment material should be placed by one of the following methods.

- a. Layer placement.
- b. Controlled compaction.
- c. Controlled compaction using density controlled strips.

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- d. Compaction controlled with a special project specification.

IMPLEMENTATION: In areas with intrinsic slope stability problems, appropriate technical resource staffs must be involved in an interdisciplinary approach to route location. Sufficient subsurface investigation and laboratory testing must be performed to general design parameters and mitigating features which will meet the constraints and requirements developed through the NEPA process.

In contracted projects, compliance with environmental analysis requirements and controls which have been provided for in the specifications is assured by enforcement of the Timber Sale Contract Provisions by the Contracting Officer and/or Engineering Representative.

REFERENCES: FSM 7706.11, 7706.12, 7710, and 7720; Standard Specifications 203, 212, 605, 613, 619, 630, and 631; Timber Sale Contract Provisions B6.31, B6.62, C5.2, C5.4, and C6.36; FSH 7709.11, Transportation Engineering Handbook and FSH 7709.56b, Drainage Structures Handbook; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes

OBJECTIVE: To minimize soil erosion from road cutslopes, fillslopes, and travelway.

EXPLANATION: Road construction exposes fresh, loose soil to the erosive force of wind, water, and traffic. Surface erosion from roads is greatest during the first year following construction. If is desirable to minimize erosion due to the adverse impacts on water quality, vehicle maintenance, road maintenance, and safety. Erosion can occur on cutslopes, fillslopes, and/or travelway. Each of the three surfaces has unique erosion consideration which are outlined below:

Stabilization Mitigation

Surface General Characteristics Measures

Cutslope Steeper, undisturbed, and more sterile soil Vegetative and mechanical stabilization

Fillslope Flatter, loose, and more fertile soil Vegetative and mechanical stabilization

Travelway Flattest, compact (due to traffic) Surface stabilization

Vegetative measures include seeding herbaceous species (grass, legumes, or browse species) or the planting of brush or trees.

Fertilization, mulching, watering, and/or erosion netting and fabrics may be required to insure success.

Mechanical measures include construction of slash windrows, straw bale dams, erosion netting and fabrics, terraces, or benching, riprapping, tackifiers, and gunnite.

Surface stabilization includes watering, dust oiling, dust pallatives, aggregate layer, bituminous surface treatment, or asphalt paving depending on traffic, soils, and climatic factors.

An integrated system of collection control, and dispersion of concentrated surface water is very important in order to prevent erosion on fillslopes, travelways, and natural slopes below cross drains and culverts.

IMPLEMENTATION: During the NEPA process, detailed mitigation measures and slope stabilization techniques are incorporated into the design package by the interdisciplinary team. Compliance with environmental analysis controls and requirements is obtained by the Contracting Officer and/or Engineering Representative through the Standard Specifications and/or Timber Sale Contract Provisions.

REFERENCES: FSM 7706.11, 7706.12, 7706.13, and 7720; Standard Specifications 50.4, 203, 204, 206A, 210, 212, 412, 619, 625, 626, 629, and 630; Timber Sale Contract Provisions B6.31, B6.6, B6.62, B6.65, B6.66, C5.2, C5.23, C5.4, C5.441, C5.46, R-1 C6.36, C6.52, C6.6, C6.601, and C6.622; SWCP A-38

15.03 and 15.04; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 15.07 - Control of Permanent Road Drainage

OBJECTIVE: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.

EXPLANATION: Degradation of water quality by sediment and the erosive effects of surface runoff can be minimized by stabilizing the road prism and adjacent disturbed areas from erosion. Velocities in the road drainage system can be dissipated before entry into the natural system by design and construction of control structures.

A number of measures can be used alone or in combination to control the detrimental effects of road drainage. Methods used to control water and reduce erosion may include: properly spaced culverts, cross drains, water bars, rolling dips, energy dissipaters, aprons, gabions, and armoring of ditches and drain inlets and outlets. Dispersal of runoff can also be accomplished by rolling the grade, insloping, outslowing crowning, contour trenching, installation of water spreading ditches, and so forth.

IMPLEMENTATION: Project location, design criteria, drainage control features, and detailed mitigation measures are determined during the NEPA process by an interdisciplinary approach. Compliance with plans, specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: SWCP 15.02, 15.03, 15.06; Timber Sale Contract Provisions B6.6, B6.66, C6.3, C6.6, and

C6.601; FSM 7721, 7723, 7706.11, and 7706.12; FSH 7709.56b, Drainage Structures Handbook; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 15.11 - Servicing and Refueling of Equipment

OBJECTIVE: To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, raw sewage, wash water, and other harmful materials.

EXPLANATION: During servicing or refueling, pollutants from logging or road construction equipment may enter a watercourse. This threat is minimized by selecting service and refueling areas well away from wet areas and surface watercourses and by using berms around such sites to contain spills.

IMPLEMENTATION: The Contracting Officer, Engineering Representative, or certified Sale Administrator will designate the location, size and allowable uses of service and refueling areas. They will also be aware of actions to be taken in cause of a hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan (SWCP 11.07).

REFERENCES: SWCP 11.07; Timber Sale Contract Provisions B6.34, C6.341, and C6.34; Standard Specifications 204.42; FSH 2409.15, Timber Sale Administration Handbook; see reference in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.13 - Controlling In-Channel Excavation

OBJECTIVE: To minimize stream channel disturbances and related sediment production.

EXPLANATION: During the construction of roads and the installation of stream crossing structures, it may be necessary for construction equipment to cross, operate in, or operate near streamcourses. However, A-41

this will be allowed only at crossings designated by the Forest Service or as necessary in the construction or removal of culverts and bridges. Close coordination is needed with the Purchaser to minimize damage to the stream and aquatic resources.

Also, excavation during the installation of streamside structures should be accomplished in the following manner in order to protect water quality. Unless otherwise approved, no excavation shall be made outside of caissons, cribs, cofferdams, or sheet piling, and the natural stream bed adjacent to the structure shall not be disturbed without approval of the Engineering Representative or Contracting Officer. If any excavation or dredging is made at the site of the structure before caissons, cribs, or cofferdams are sunk in place, all such excavations will be restored to the original ground surface or the stream bed will be protected with suitable stable material. Material deposited within the stream area from foundation or other excavation shall not be discharged directly into live streams but shall be pumped to settling areas shown on the drawings or approved by the Engineering Representative or Contracting Officer. If the channel is damaged during construction, it should be restored as nearly as possible to its original configuration without causing additional damage to the channel. Excavations for stream crossings should be started early enough in the summer so that the installation is complete before winter.

IMPLEMENTATION: Project location and mitigation measures are developed by the interdisciplinary team during the NEPA process and are inserted into the contract. Compliance with the management requirements, contract specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: FAR 52.213-3, 52.236-15, and 4G-52.236-107; FSM 7721 and 2502.1; Standard Specifications 206; Timber Sale Contract Provisions C6.36, C6.52, and B6.5; EO 11988, Flood Plain Management; SWCP 11.04, 11.05, 14.03, 14.06, and 15.12; see reference in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide - Erosion Prevention and Control on Timber Sale Areas, May 1981

PRACTICE: 15.14 - Diversion of Flows Around Construction Sites

OBJECTIVE: To minimize downstream sedimentation by insuring that all stream diversions are carefully planned.

EXPLANATION: Flow must sometimes be guided or piped around project sites. Typical examples are bridge and dam construction. Flow in streamcourses will be diverted if the Forest Service deems it necessary for the Purchaser to do the job. Such a diverted flow shall be restored to the natural streamcourse as soon as practicable and, in any event, prior to the major storm season or fish migration season. Stream channels impacted by construction activity will be restored to their natural grade, conditions, and alignment as soon as possible.

IMPLEMENTATION: The interdisciplinary team during the environmental analysis will identify where diversions are required and the project design will include mitigative measures to protect fishery values and other downstream uses. The NEPA process may require project review by other Federal, State, and/or local agencies and private parties, to insure that all factors are considered. For In-Service projects, Forest Service supervisors are responsible for implementing design standards and management requirements. On contracted projects, compliance with contract specifications and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: Timber Sale Contract Provisions B6.5, C6.3, C6.51, C6.52, and C6.6; FSM 2505.1 and 7721; FAR 52.213-3, 52.236-15, and 4G-52.236-107; FSH 7709.56b, Drainage Structures Handbook; EO 11988, Flood plain Management; SWCP 11.04, 11.05, 14.03, 14.06, 15.12, and 15.13; see reference in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.16 - Bridge and Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)

OBJECTIVE: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.

EXPLANATION: Excavation in or near streamcourse is a common requirement for the installation of

bridges, culverts, and other streamside structures such as weirs, check dams, riprapping, or fish passage structures. Surplus material should not obstruct the streamcourse including the floodplain nor the efficiency of the associated structure. Preventive measures include:

- a. Diverting stream flow around project sites during construction in order to minimize erosion and downstream sedimentation.
- b. Easily erodible material shall not be deposited into live streams.
- c. Any material stockpiled on floodplains shall be removed before rising waters reach the stockpiled material.
- d. During excavation in or near the streamcourse, it may be necessary to use suitable coffer dams, caissons, cribs or sheet piling. This will usually be the case where groundwater is contributing a significant amount of water to the immediate excavation area. If any of the aforementioned devices are used, they will be practically watertight and no excavation will be immediately outside of them. If water from subsurface strata is not significant, pumping may be used, provided the sediment from the pumped water can be disposed of where it will not re-enter the stream during high flows.
- e. Water pumped from foundation excavation shall not be discharged directly into live streams, but shall be pumped into settling ponds.
- f. When needed, bypass roads should be located to have the minimal disturbance on the streamcourse.
- g. The construction activity in or adjacent to the stream will be limited to specific times to protect beneficial water uses (such as fisheries).

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IMPLEMENTATION: Project location and detailed mitigative measures are developed in the environmental analysis and are detailed in the appropriate NEPA document using an interdisciplinary team approach. Forest Service supervisors are responsible for insuring that In-Service projects meet the design standards. For contracted projects, compliance with contract specifications and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: FAR 52.213-3, 52.236-15, and 4G-52.235-107; Standard Specifications 206 and 206A; Timber Sale Contract Provision C6.5; FSM 2505.1; see reference in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.17 - Regulation of Borrow Pits, Gravel Sources and Quarries

OBJECTIVES: To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbance in those gravel sources suitable for development in floodplains.

EXPLANATION: Borrow pits, gravel sources, and quarries are often susceptible to erosion due to steep side slopes, lack of vegetation, and/or their proximity to water courses. Whenever possible, the top soil should be removed and stockpiled for use as surface dressing during the reclamation phases, prior to excavation of the site.

Drainage design for the excavation should consider temporary erosion control measures during the life of the material source and permanent drainage control measures after the site has been rehabilitated.

When excavation of the site has been completed on all or part of the area, and the site will not be used again, the sides will be sloped, graded, or scaled and the general pit are smoothed and stabilized.

Oversized material, if planned for future use as riprap or derrick rock, should be stockpiled. If not, it should be scattered or buried. Finer material, if available, should be spread over the bottom of the pit prior to spreading stockpiled or imported topsoil. Seeding, mulching, and/or planting should be carried out. If the site will be used again, the above requirements will be limited to those essential to resource protection between uses. Access roads to the site should also have temporary or permanent drainage design for erosion control depending on the life of the pit or the roads should be ripped, drained, blocked to traffic, and seeded, mulched, and/or planted unless other uses are planned.

Borrow pits and gravel sources located in floodplains require special attention. Material deposited in floodplains or along channel sections during storm runoff often provide excellent and inexpensive sand and gravel. Because of easy access, these deposits are often in demand. With careful planning and design, these deposits can be removed with minimal impact on water resources. Under some circumstances, sand and/or gravel removal may alter stream flow characteristics and consequently affect stream channel stability and create a new sediment source. Excavation of these deposits within stream channels should be limited to those above the waterline which is normal for the period of the excavation. If the borrow area is subject to periodic flooding, leveling, shaping, or other special drainage features shall be provided.

Excavation in flood plains should not take place below the water table unless sediment basins are built to contain or catch the resulting sediment. Sediment basins should not be subject to washouts. If excess sediment accumulates in basins, it should be excavated to clean the basin and the sediment removed to an approved site.

Wash water or waste from concrete batching or aggregate operations shall not be allowed to enter streams prior to treatment by filtration, flocculations, settling and/or other means. The potential pollution of adjacent water resources by blasting agent in quarry operations shall be addressed in the pit operation plan.

IMPLEMENTATION: Project feasibility, location, suitability, and the limits for disturbance and sediment production will be identified through the NEPA process using an interdisciplinary approach. Detailed mitigative measures are developed by the design engineer using criteria from the environmental analysis

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and through consultation with technical resource staffs when needed. Development of borrow pits or

gravel sources in the floodplain will be coordinated with State and local agencies.

Special-use permits issued for borrow pits, gravel sources, and quarries will include the above requirements and District Rangers or their representatives are responsible for insuring compliance. Forest Service supervisors are responsible for implementing In-Service projects to design standards. For contracted projects, compliance with management requirements, specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: FSM 2511, 2502.1, 7706.11, 7706.12, 7721; FSH 7709.11, Transportation Engineering Handbook, and FSH 7709.56, Road Pre-construction Handbook; FAR 52.236-09; Standard Specifications 203, 210, 611, 624, 625, 626, and 629; Timber Sale Contract Provision B6.31, B6.6, B6.62, B6.65, and B6.66, C5.2, C5.23, C5.4, C6.36, C6.52, C6.6, C6.601, C6.622; Water Pollution Control Act, 33 USC 466; NEPA; Montana Water Quality Act and Hardrock Act; Idaho Dredge and Placer Mining Act, Title 47, Ch. 13; SWCP 11.04, 11.05, 15.03; see reference in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.18 - Disposal of Right-of-Way and Roadside Debris

OBJECTIVE: To insure that debris generated during road construction is kept out of streams and to prevent slash and debris from subsequently obstructing channels.

EXPLANATION: As a preventive measure, counteractions debris and other newly generated slash developed along roads near streams shall be disposed of by the following means as applicable:

a. On-Site.

1) Windrowing (SWCP 15.03).

2) Scattering

3) Burying

4) Chipping

5) Disposal in Cutting Units

6) Piling and Burning

b. Removal to agreed upon locations.

c. A combination of the above.

d. Large limbs and cull logs may be bucked into manageable lengths and piled alongside the road for fuelwood.

IMPLEMENTATION: Criteria for the disposal of Right-of-Way and roadside debris are established in the environmental analysis by an interdisciplinary team. Project location and detailed mitigative measures are also developed. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards. For contracted projects, compliance with plans, specifications, and operating plans is assured by the Contracting Officer, Engineering Representative, or certified Sale Administrator.

REFERENCES: Timber Sale Contract; SWCP 13.05, 14.20, and 15.03; see reference in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.19 - Streambank Protection

OBJECTIVE: To minimize sediment production from streambanks and structural abutments in natural waterways.

EXPLANATION: The stabilization of stream embankments disturbed by the construction of a water crossing or a roadway fill parallel to a streamcourse, is necessary to prevent erosion of the material during natural stream flow. To reduce sediment and channel bank degradation, it is necessary to

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incorporate "armoring" in the design of a structure to allow the water course to stabilize after construction. Riprap, gabion structures, and other measures are commonly used to armor stream banks and drainage ways from the erosive forces of flowing water. These measures must be sized and installed in such a way that they effectively resist erosive water velocities. Stone used for riprap should be free from weakly structured rock, soil, organic material and materials of insufficient size, all of which are not resistant to stream flow and would only serve as sediment sources. Outlets for drainage facilities in erodible soils commonly require riprapping for energy dissipation.'

IMPLEMENTATION: Project location and detailed mitigative measures are developed through the NEPA process to meet the objectives and requirements of the management. Forest Service supervisors are responsible for implementing In-Service projects to design standards and management requirements. For contracted projects, compliance with contract specifications and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: SWCP 15.03; see references in "Best Management Practice" Definition (05--2 and 3); In R-4: R-4 Technical Guide-Erosion Prevention and Control on Timber Sale Areas, May 1981.

PRACTICE: 15.20 - Water Source Development Consistent With Water Quality Protection

OBJECTIVE: To supply water for road construction and maintenance and fire protection while maintaining water quality.

EXPLANATION: Water source development is normally needed to supply water for road construction, dust control, mixing surface, compaction, planting and for fire control requirements of the timber Purchaser.

Water source development should aim toward the construction of durable, long term water sources rather than the construction of hasty, expedient developments. Permanently designed sources, such as tanks, will result in the lowest, long term impact to the affected streams.

Other considerations in the development of water sources should be:

a. Downstream flow should not be reduced so as to detrimentally affect aquatic resources, fish passage, or other uses.

b. Temporary cofferdams should be constructed of sandbags containing sand or clean gravel, or of other materials and means which will not induce sediment in the stream.

- c. Overflow should go directly back into the stream.
- d. All temporary facilities for gathering water will be removed prior to causing any resource damage.

IMPLEMENTATION: Certified Sale Administrators and Engineering Representatives in conjunction with technical resource staffs should evaluate streams in which water developments may be constructed. Project location and detailed mitigative measures are developed by the interdisciplinary approach during the environmental analysis. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards and management requirements. For contracted projects, compliance with contract specifications and the operating plan is assured by the Contracting Officer and/or engineering Representative.

Any damage to resources caused by Purchaser's operations or fire suppression activities shall be retired by purchaser or fire suppression crews in a timely and agreed manner to the extent practical to restore and prevent further resource damage.

REFERENCES: Standard Specification 207; Timber Sale Contract Provisions; SWCP 14.03; Timber Sale Administration Handbook (FSH 2409.150; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.21 - Maintenance of Roads

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OBJECTIVE: To maintain all roads in a manner which provides for soil and water resource protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities.

EXPLANATION: Roads normally deteriorate because of use and weather impacts. This deterioration can be minimized through proper and timely maintenance and/or restriction of use (SWCP 11.09). All system roads will be maintained to at least the following level: Provide the basic custodial care required to protect the road investment and to insure that damage to adjacent land and resources is held to minimum. This level of maintenance often requires an annual inspection to determine what work, if any, is needed to keep drainage functional and the road stable. This level is the normal prescription for roads that are closed to traffic. As a minimum measure, maintenance must protect drainage facilities and runoff patterns. Higher levels of maintenance may be chosen to reflect greater use or resource administrative needs. Additional maintenance measures could include resurfacing, outsloping, clearing debris from dips and cross drains, armoring of ditches, spot rocking, and drainage improvement. Maintenance needs will be reflected in an annual road maintenance plan developed to include all roads under Forest Service control. Individual maintenance plans will be developed annually for each timber sale and for each cost share area outlining performance standards, responsibilities, and timing. For maintenance of roads on active timber sales, the Forest Service and the Purchaser shall annually agree at the beginning of the operating season on an Annual Road Maintenance Plan outlining responsibilities and timing. If the road is subjected to commercial use, the Forest Service may collect deposits to facilitate road maintenance and to equitably assess maintenance cost of each user. In addition to timely performance of regular maintenance, each Forest should have an emergency action plan which identifies procedures to be used during periods of high runoff to protect facilities and reduce resource damage.

IMPLEMENTATION: The work is controlled through the Forest Engineer who is responsible for the development of the annual road maintenance plan based on condition surveys. Maintenance levels are established for each road and maintenance performed in accordance with standards. On timber sales, maintenance is a Purchaser responsibility and compliance with standards is assured by the Contracting Officer, Engineering Representative, or certified Sale Administrator. On system roads outside of active timber sales, road maintenance is insured by the Engineering Representative or Contracting Officer.

REFERENCES: FSM 7730.2, 7732, and 7735; FSH 2409.15, Timber Sale Administration Handbook and FSH 7709.15, Transportation System Maintenance Handbook; Timber Sale Contract provision C5.4; SWP 11.09; see references in "Best management Practice" Definition (05--2 and 3).

PRACTICE: 15.22 - Road Surface Treatment to Prevent Loss of Materials

OBJECTIVE: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.

EXPLANATION: Unconsolidated road surface material is susceptible to erosion during precipitation events. Likewise, dust derived from road use may settle onto adjacent water bodies. On timber sale roads, the Purchaser shall undertake measures to prevent excessive loss of road material if the need for such action has been identified. Road surface treatments may include: water, dust, oiling, penetration oiling, sealing aggregate surfacing, chip-sealing, or paving.

IMPLEMENTATION: Project location and detailed mitigative measures are developed by an interdisciplinary approach to meet environmental analysis criteria. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards and management requirements. On contracted projects, compliance with contract specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: Timber Sale Contract; FSH 2409.15, Timber Sale Administration Handbook.

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PRACTICE: 15.23 - Traffic Control During Wet Periods

OBJECTIVES: To reduce the potential for road surface disturbance during wet weather and to reduce sedimentation probability.

EXPLANATION: The unrestricted use of many National Forest roads during wet weather often results in rutting and churning of the road surfaces. Runoff from such disturbed road surfaces often carries a high sediment load. The damage/maintenance cycle for roads that are frequently used during wet periods can

create a disturbed road surface and sediment source.

Roads that must be used during wet periods should have stable surface and sufficient drainage to allow such use with a minimum of resource impact. Rocking, oiling, paving, and armoring are measures that may be necessary to protect the road surface and reduce erosion potential. Roads not constructed for all weather use should be closed during the wet season. Where winter field operations are planned, roads may need to be upgraded and maintenance intensified to handle the traffic without creating excessive erosion and damage to the road surfaces.

IMPLEMENTATION: Road closures (SWCP 11.09) and traffic control measures should be implemented on all roads when damage would occur as a result of use during wet weather. Project-associated implementation procedures can be enforced by District personnel. Hauling activity can be controlled by the certified Sale Administrator within active timber sales. The decision for closure is made when the responsible Line Office determines that a particular resource or facility needs protection from use. Detailed mitigative measures are developed by an interdisciplinary approach as necessary. Forest Service supervisors are responsible for implementing In-Service projects according to design standards. For contracted projects, compliance with plans, specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: FSM 7731.4, SWCP 11.09, 13.06, and 14.04; Timber Sale Contract provisions B5.12, B5.22, and C5.12; FSH 2409.15, Timber Sale Administration Handbook; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.24 - Snow Removal Controls

OBJECTIVE: To minimize the impact of snow melt on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.

EXPLANATION: This is a preventive measure used to protect resources and indirectly to protect water quality. Forest roads are sometimes used throughout the winter for a variety of reasons. For such roads, the following measures are employed to meet the objectives of this practice:

- a. The Purchaser is responsible for snow removal in a manner which will protect roads and adjacent resources.
- b. Rocking or other special surfacing and/or drainage measures may be necessary, before the operator is allowed to use the roads.
- c. During snow removal operations, banks shall not be undercut nor shall gravel or other selected surfacing material be bladed off the roadway surface. Ditches and culverts shall be kept functional during and following roadway use. If the road surface is damaged, the purchaser shall replace lost surface material with similar quality material and repair structures damaged in blading operations.
- d. Snow berms shall not be left on the road surface or shall be placed to avoid channelization or concentration of melt water on the road or erosive slopes. Berms left on the shoulder of the road shall be removed and/or drainage holes opened at the end of winter operations and before the spring breakup. Drainage holes shall be spaced as required to obtain satisfactory surface drainage without discharge on erodable fills. On insloped roads, drainage holes shall also be

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provided on the ditch side, but care taken to insure that culverts and culvert inlets are not damaged.

IMPLEMENTATION: Project location and detailed mitigative measures are developed by the interdisciplinary team during the NEPA process. Contracted projects are implemented by the Purchaser. Compliance with criteria in the contract specifications and operating plan is assured by the contracting Officer or Engineering Representative.

REFERENCES: Timber Sale Contract provisions C5.46; Standard Specification 203.09; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE: 15.26 - Surface Erosion Control at Facility Sites

OBJECTIVE: To minimize the amount of erosion and sedimentation at developed sites.

EXPLANATION: On lands developed for administrative sites, ski areas, campgrounds, parking areas, or waste disposal sites much ground is cleared of vegetation. Erosion control methods need to be implemented to stabilize the soil and to reduce the amount of stream sedimentation. Some examples of erosion control methods that could be applied: grass seed, jute mesh, tackifiers, hydromulch, paving or rocking of roads, water bars, cross drains, or retaining walls.

To control erosion and sedimentation, the natural drainage pattern of the area should not be changed.

Sediment basins and sediment filters should be established to filter surface runoff. Diversion ditches and berms should be built to divert surface runoff around bare areas. Construction activities should be scheduled to avoid periods of heavy precipitation or runoff.

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IMPLEMENTATION: Mitigative measures are developed by the interdisciplinary team during the NEPA process and incorporated in the project by the design engineer. Forest Service supervisors are responsible for implementing In-Service projects to design standards and management requirements. For contracted projects, compliance with plans, specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

REFERENCES: SWCP 11.08, and 11.12; FSM 2522; see references in "Best Management Practice" Definition (05--2 and 3).

Appendix B

Past, Present and Reasonably Foreseeable Actions for the Hydrology Analysis.

Action	Past	Present	Reasonably Foreseeable
Timber harvest activities *	X	X	X
Prescribed burning for site prep and fuels treatment	X		
Tree planting	X		
Public activities: firewood cutting, driving roads, camping, snowmobiling, hunting, hiking, berry picking	X	X	X
Road construction	X		
Road decommission	X		
Road maintenance	X	X	X
Wildfires	X		Unknown
Fire suppression	X	X	X
Trail maintenance	X	X	X
Pre-commercial timber stand improvement: pruning and thinning	X		
Spraying herbicides to control and prevent noxious weeds	X	X	X
Clearing brush and trees to maintain helispots	X	X	X
Grazing	X	X	X
Mining	X		Unknown
Defensible space projects on private lands		X	

* Reasonable Foreseeable Timber Sales include the following:

East Fork Meadow Creek
 Leonia HFRA
 Lakeview Reeder HFRA
 Lower Priest
 Twentymile Creek
 Schweitzer Fuels HFRA